A GUIDE To SYSTEMATIC READINGS in the ENCYCLOPÆDIA BRITANNICA

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A GUIDE

TO

SYSTEMATIC READINGS

IN THE

ENCYCLOPÆDIA BRITANNICA

NEW AND REVISED EDITION

BY

JAMES BALDWIN, PH.D.

Author of "The Book Lover," "The Book of Elegies," "The Story of Siegfried," etc.

1941

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GUIDE TO BRITANNICA





PREFACE.

ALTHOUGH the *Encyclopædia Britannica* has long been recognized as the greatest of reference works, and although its possessors may have never consulted it without complete satisfaction, yet its full value has seldom been recognized. It has usually been regarded simply as a repository of general information, to be kept ready at hand for consultation as occasion should demand. But while this is the ordinary use of the *Britannica*, it has been found that it possesses a broader function, and that it may be utilized in such manner as to perform the office of a great educational agent. The *Britannica* is a work of reference, and much more: it is a collection of all histories, all biographies, all arts, all literatures, and all scientific, professional, and mechanical knowledge; but on account of its comprehensiveness, extending as it does through so many large volumes, it presents such an "embarrassment of riches" that those who consult it fail sometimes to discover *all* that is suited to their individual needs. It is evident, therefore, that if each reader and patron of this great library can have a guide to point out to him, according to his vocation, the parts that are the most helpful to him, he will be able to systematize his reading or his investigations; and thus, while economizing

both time and labor, reach the highest results. The present volume has been prepared for that purpose; and it is believed that, recognizing its helpfulness, the many thousand owners of the *Britannica* will welcome it as an invaluable addition to their libraries. The plan has been to direct each individual how to draw from this great storehouse of knowledge that which will cover with all desirable completeness the line of work in which he is most interested, thus assisting him in the knowledge of his particular business, and aiding him in its prosecution.

It being recognized that the *Britannica* contains a great deal of interesting and profitable matter for boys and girls, the first part of this GUIDE is directed to young people. By the aid of brief but graphic text and copious references, the youth is led along pleasant avenues of research, and thus aided in acquiring a habit of reading and of investigation that will continue through life, and add largely to his chances of success.

The second part is especially designed for students. The scholar who is desirous of some means whereby to supplement the work of the school or the college, will find here the very thing that he is seeking. The earnest, ambitious young man or young woman who is being self-educated, because unable to secure the aid of instructors, will find here a teacher that will point the way to the acquirement of a thorough knowledge of almost every branch of science or art. Numerous courses of study are outlined, which may be pursued independent of schools; many profitable lines of research are suggested, and the best

ways of obtaining a fund of general information are pointed out.

The fact that fifty-two text-books used in our leading colleges and universities have been drawn from the *Britannica* emphasizes its value to students.

Through our excellent system of common schools, every boy or girl in the land is furnished with the rudiments of an education. But in the school, the child is only started on the way; the best that can be done is to provide him with a few essentials, and give him some slight impetus that will keep him moving on in the right direction. If he continues his studies beyond the public schools, he may be conducted a little farther — but it is only a little. No one's education was ever finished in a university. We are all, to a greater or less degree, self-educated. A great deal of what the schools have foisted on us as knowledge has proved to be worthless to us, and is allowed to drop from our minds as soon as we are left to ourselves. The better part of our education is that which we acquire independently — through reading, through observation, through intercourse with others—an ever increasing stock of what is called general information. It is the aim of this GUIDE to help, not only students, but everybody else, to gather this information in an orderly way, without unnecessary expenditure of time and labor.

The third part of this volume is devoted to the busy world at large. Its object is to help the busy man, no matter what his business may be, to pick out from the *Encyclopædia Britannica* just that kind of information that

will be of the greatest value to him in his calling. There is hardly a trade, industry, or profession in the civilized world that is not noticed somewhere in this department. A mere glance at the various chapters will indicate their practical value.

On the whole, it is confidently believed that the plan of using the *Encyclopædia Britannica*, as presented in this GUIDE, will fill a gap and perform an important service in our system of education. It should be a very material aid, not only to those whose schooldays have been of limited duration, and who wish to continue their studies without the guidance of a teacher, but to people of every class and condition in life — to students, merchants, farmers, mechanics, housekeepers, and professional men of all sorts. It should enable boys, girls, men, women, and whole families to spend their leisure hours pleasantly and profitably with the great *Encyclopædia*, thus realizing one of its most important aims by making it the most powerful aid to home culture or self-education that the world has ever known.



PREFACE TO THE NEW AND REVISED EDITION.

THE publication of five new volumes of supplementary matter to the *Encyclopædia Britannica* not only furnishes an opportunity for the revision and enlargement of this GUIDE, but renders such a revision an absolute necessity. Encouraged by the flattering reception accorded to the first edition of these systematic readings, the compiler has ventured to extend his original plan by the addition of twelve new chapters, besides the insertion of many hundreds of references not previously included in the work. Some of the former readings have been entirely re-written, and the chapters in the third division have been arranged in more logical order. It is believed that, in this revised edition of the GUIDE, there are but very few divisions of human thought, or of human activity, which have not received some attention. An examination of the index at the end of the volume will reveal the comprehensive nature of its contents.

January, 1897.

OF THE
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INTRODUCTION.

"IT is ours—this *Encyclopædia Britannica*—and now how shall we use it in order to derive the greatest possible benefit from it?" This is probably the question which more than one purchaser of the *Britannica* asks himself as he removes the bright new volumes from their wrappings, and contemplates his lately acquired possession. Let us first arrange the twenty-odd books side by side on their shelf, and take a look at the work as a whole.

What shall we do with it?

It is the greatest work of its kind in the world, everybody says. In these volumes are the elements of a complete education in any branch of knowledge that you may choose. You cannot mention a single subject about which men think and talk, that does not receive its share of attention somewhere in this wonderful work. It contains a rich fund of information for everybody, from the school-boy or school-girl to the most learned philosopher. It is valuable alike to the farmer and the merchant, to the mechanic and the professional man. Turn over the pages of a single volume, and notice the great variety of articles, some necessarily brief, others very long and comprehensive. Notice the numerous illustrations, the maps, and the fine full-page plates. See the list of famous specialists and well-known writers who have helped to make this volume. Surely, this is a work which every man ought to be proud to own.

But unless we know how to use our *Encyclopædia*, we

shall fail to get from it as much benefit as we might. No book is of value unless its owner knows how to extract some pleasure or profit from its pages. It will not be hard to get both pleasure and profit from the *Britannica*, even though we should allow it to remain on its shelf and consult it only when we want to find the answer to some question that is asked. Most people use an encyclopædia in that way; and many do not know that it was designed for any other purpose. That is the proper and only way in which to use a dictionary. But the *Encyclopædia Britannica* is a great deal more than a dictionary, and it is capable of imparting more knowledge and more enjoyment than all the dictionaries in the world.

In order that we may make the most of the rich storehouse of knowledge that is ours, let us consult our GUIDE TO THE ENCYCLOPÆDIA BRITANNICA. Here a large number of the most interesting subjects are arranged systematically under appropriate headings or in special chapters. The first five chapters refer to subjects that are of interest to young people. There are thousands of older people, too, who will like these chapters.

Young People's Department.

The next seventeen chapters are designed to aid students and specialists in the prosecution of their studies and investigations. The vast range of the *Britannica* is nowhere better illustrated than in these chapters. Among the easier courses in reading here marked out, are those in History (Chapter VI.), in Geography (Chapter XIII.), in Bible History (Chapter XIX.), and in Mythology (Chapter XX.). In Chapter XI. there are three courses in Zoölogy—the first two being popular courses, which everybody may understand and enjoy; the third, a purely scientific course, intended for only special students. Some other

Students' Department.

chapters, notably that on Mathematics (Chapter XV.), refer to subjects and articles in which only scholars and specialists usually take an interest. Although they may seem of but little use to us now, there will probably be a time when some of us shall grow up to them, and find them to be exactly what is required to meet our wants. Besides this, there are some of our neighbors and friends who are now especially interested in those subjects, and would not want such articles omitted.

Busy People's Department.

After the Students' department, there are more than thirty chapters showing tradesmen, farmers, teachers, and others how to derive the greatest good from the *Britannica*. Some of these chapters are sufficiently broad in their scope and character to be of interest to every intelligent person, no matter what his calling in life. For instance, what man in this country will not be benefited by a study of the chapter entitled "The American Citizen"? What American citizen will not find much interesting and valuable information concerning the history of money, the conflict of standards, and the national finances, in the brief chapter entitled "The Banker"? To young men and young women wishing to enter the civil service of their city, state, or country, in any capacity, the chapter for "The Candidate for the Civil Service" will give much information and assistance that cannot be easily obtained from any other source. Here is a chapter to aid the young lawyer in fitting himself to take a higher position in his profession. Here is a chapter for the preacher, showing him what a complete theological library every owner of the *Britannica* has at his service. Here is a chapter for the farmer, telling him where he may learn all about soils and crops and fertilizers and farming tools, and the thousand other things which interest all intelligent tillers of

the ground. Here is a chapter for the soldier, and for all would-be soldiers, directing them to a vast fund of information about wars and battles and fire-arms and military law —such as can be found in no other single publication in the world. But I need not enumerate further. A glance at the pages which compose the latter half of the book will show you that no person in all this busy world of ours has been forgotten. Surely, with so many hints and helps at our hands, we shall not be content to use our *Encyclopædia* merely as a dictionary. The GUIDE will suggest many ways in which we may begin immediately to make it yield us large returns of pleasure and profit.

Family Reading Circle.

Would we engage in some kind of intellectual employment during the long evenings of winter? Let us form ourselves into a family reading circle, and read some of the lighter courses suggested by the GUIDE (see Chapters I., II., III., IV., VI., XII., XVII.). Would we like to know where we can pick up something to read occasionally for pastime rather than study? Let us see if Chapter XXII. will not help us. Do we want to improve our brawn and muscle through systematic and pleasurable exercise? We may find something in the chapter on games and sports that will point out the way. Is Tommie troubled about the composition that he is to write for the examination at school? Perhaps the chapter for the Writer will be found helpful. Is Mary anxious to become a teacher, and yet not ready to begin a course of study at the normal school? The GUIDE will direct her to some very complete courses of reading on subjects concerning which no teacher can afford to be ignorant. Is John, who cast his first ballot last year, deeply interested in politics and hopeful that he may some time become a candidate for public office? Let him devote his spare time to the study of such articles as the

GUIDE indicates for the American Citizen, the Public Speaker, and the Political Economist. Is Andrew skilful with tools, and handy about making things? The GUIDE has numerous interesting suggestions for the Inventor, the Mechanic, the Electrician, and the Engineer.

And so, for every person and for every occupation in life, the *Encyclopædia Britannica* comes with its inexhaustible fund of information, and this little GUIDE which accompanies it shows each individual just how he can best extract the information which he needs.

EXPLANATIONS.

References to the Britannica.

The references in the GUIDE are necessarily brief, but there will be no trouble in understanding them. The titles of important subjects are frequently printed in SMALL CAPS; but where a number of titles occur in a single list, all are generally printed in plain lower-case letters. The volume of the *Britannica* is indicated by Roman numerals; the page by Arabic figures. Occasionally the letter *a* is used to indicate the left-hand column of a page, and the letter *b* the right-hand column—accents being added to show whether the matter referred to begins at the top, the middle, or the bottom of the column. When the page referred to is found in the American Additions and Revisions (matter which is printed as supplementary to the *Encyclopædia Britannica*), the figures denoting it are preceded by the abbreviation *sup.*

EXAMPLES.—Notice the following references:

(1) Bracelets, IV. 187.
(2) Quill pens, IX. 60 a′
(3) Sea serpent, XXI. 608.
(4) Bells, sup. 412–413.
(5) May-day customs, XV. 647 b‴

It is easy to understand what each one of these references means. An examination of them, in connection with the explanations above, shows us

(1) That the article on BRACELETS is found in volume IV., page 187.

(2) That QUILL PENS are described in volume IX., page 60, beginning at the middle of the first column.

(3) That an account of the SEA SERPENT occurs in volume XXI., page 608, beginning at the top of the first column.

(4) That there is an article on BELLS in the Supplements, pages 412 and 413.

(5) That an account of MAY-DAY CUSTOMS may be found in volume XV., page 647, beginning at the bottom of the second column.

So many special subjects receive treatment in some of the chapters, that no mere chapter-headings are sufficient to indicate everything that is included within their limits. For example, there is no distinct chapter for the shoemaker, the carpenter, the mason, the cook, the fisherman; but each of these busy workers receives his share of attention in the GUIDE. Look for these names, not in the table of contents, but in the index at the end of the volume. It will be convenient to use this index often.

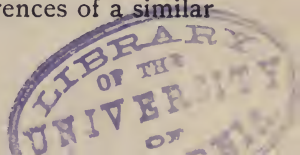
Few persons will have any difficulty in using the INDEX VOLUME of the *Britannica*. In most cases, if you desire to make a complete study of any given subject, it will be best to look for that subject at once in the Index volume. The word which you are looking for will probably be found in its proper alphabetical place. There you will be directed to every article or passage in the *Britannica* wherein any important mention of the subject occurs. The first reference is usually to the special article upon the subject, or if

there is no special article, it will direct you to the next best thing—the fullest or most complete description. For example, suppose you want to learn all about the Indians. Turn to the Index volume, and on page 223 you will find the following entry:

The Index Volume.

> INDIANS, American, XII. 822, 830; I. 685; displacement of, XXIII. 819; languages of, XVIII. 780; dictionaries of languages, VII. 192; mythology, XVII. 148; religions, XX. 364; totems, XXIII. 467; Eliot's work among, VIII. 137; Penn's influence over, XVIII. 496; of Costa Rica, VI. 450; of South America, I. 89; of Colombia, VI. 155; of Peru, XVIII. 677.

Consulting the first reference ("volume XII., page 822."), you will find an article of eleven pages in length, giving a concise account of the Indians, their physical traits, tribal divisions, customs, etc. The second reference ("I. 685"), directs the reader to the article AMERICA, where there is a complete history of the aboriginal races, with still further notices of their habits, languages, religions, etc. The third reference ("displacement of, XXIII. 819"), directs attention to a paragraph under the article headed UNITED STATES, in which an account is given of the westward movement of immigration and the consequent displacement of the Indian tribes. The remaining references may be found with equal facility and are self-explanatory. After having consulted as many of these as you think necessary, you may still wish to learn the very latest facts relative to the status of the Indian tribes in the United States. Turning to the Index to the Supplements, see whether or not there are additional references of a similar


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character there. By turning to any articles that may be thus indicated, you will doubtless find all the information on this subject that you desire.

Any other subject may be studied in a similar way.

Now, take the word SEA, or LONDON, or COLUMBUS, and find all the references to it that are given in the Index.

Whenever the word for which you are looking cannot be found in the first part of the Index, look for it in the second part which relates to the Supplements.

Condensed Biographical Dictionary.

Another important feature of the Index volume, and one which is not alluded to elsewhere in this GUIDE, is the Condensed Biographical Dictionary. For quick and ready reference this dictionary will often prove to be of great service. It is one of the most complete dictionaries of its kind ever published, containing the names of more than twenty-five thousand persons, with their titles or vocations, and the dates of birth and death. Further particulars with regard to many (but, of course, not all) of these individuals may be found by referring to the Index, which will point out the exact place in the *Britannica* where the desired information is given.

PART I.

THE YOUNG PEOPLE.

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CHAPTER I.

TO THE BOYS AND GIRLS.

"Now, my young friends, this habit of reading is your pass to the greatest, the purest, and the most perfect pleasures that God has prepared for his creatures. But you cannot acquire this habit in your old age; you cannot acquire it in middle age; you must do it now, when you are young. You must learn to read, and to like reading now, or you cannot do so when you are old."—*Anthony Trollope.*

ALLOW me to introduce you, boys and girls, to the *Encyclopædia Britannica.* It is, without question, the greatest book of its kind that has ever been published in our language. Here we have it in over a score of huge volumes with thousands of illustrations and hundreds of maps and diagrams. The amount of matter which it contains is so great that it would take you several years to read it through.

The Britannica.

But it is not intended that anybody shall read it through. It would be extremely foolish for you to begin with the first page of the first volume, and try to read everything in the order in which it comes. It would be like sitting down at a table loaded with delicacies and trying to eat everything from the first dish to the last, without considering either your tastes or your needs. No person in his right senses would think of doing such a thing. You will readily understand, therefore, how important it is that you should know, at the very outset, what this famous book is, and how it ought to be used in order that it may be of the greatest possible assistance and value to you.

What is an encyclopædia?

It is a book which treats of all the various kinds of knowledge. In other words, it is a book which contains some information concerning everything that can be learned by man in this life. If you could know the whole encyclopædia by heart, you would be a very learned person, indeed. But, of course, this is impossible; and it would be very unwise for you to think of becoming a great scholar in that way. You do not want to make a walking encyclopædia of yourself.

What is it?

Does the carpenter carry his chest of tools around on his back while he is at work? Of course not. But he knows where the chest is, and he knows just where each tool is placed in it, so that he can lay his hands upon it in a moment, even though his eyes should be shut. So it should be with your encyclopædia. You don't want to load your mind with the millions of facts which it contains, and burden your memory with the retention of them all. But you want to know your encyclopædia so well that when it is desirable to lay hold of a certain fact, you can do so without loss of time, and without unnecessary labor.

How to use it.

Again, among the great variety of tools which the carpenter has in his chest, there are some which he uses very often, there are others which he needs only on special occasions, and there are still others which, being required for only the very finest work, may not be called into use more than once or twice for years at a time. But it is necessary to have all these tools, and to know how to handle them, for there is no telling when they may be called for. And so it is with your encyclopædia. Some of its articles will be helpful to you, day by day, as you carry on your studies at school or your work at home. Others are, at

the present, of no interest whatever to you. Indeed, you will find not a few that are wholly incomprehensible to you. But that which is of no use to-day may be just the thing that you will need a year, two years, or five years from to-day; and the articles which you cannot now by any means understand may contain exactly what you will enjoy and be profited by when you are a little older. And so it will be a good thing at the outset to confine your inquiries and your readings to those subjects which are the easiest for you and in which you will naturally be the most deeply interested.

Now, here are some curious things which you may like to read about. They have been selected at random from among hundreds of others that will from time to time be suggested to you.

Curious Things.

The Bo-tree (the oldest tree in the world), sup. 529, IX. 154.

The Banyan tree, III. 348.

Great trees of California, IV. 704.

The Upas tree, XXIII. 859.

Pygmies (famous little people of Africa), XX. 120.

Gipsies, X. 611. This is a long article, and a part of it may not be interesting to you; but you will certainly like to read the section which describes their modes of life, X. 616.

Magic mirrors, XVI. 501.

Poison rings, XX. 561.

Ancient bottles, IV. 167.

Great Bells, sup. 412.

Kites and Kite-flying, sup. 1797.

Bracelets, IV. 187.

History of fans, IX. 27.

History of the American Flag, sup. 1285.

Flags in ancient and modern times, IX. 276.

Holidays, sup. 1595.
The sea serpent, XXI. 608.
Cataracts and waterfalls, sup. 722.
Quill pens for writing, IX. 60.
The great wall of China, sup. 1457.
The thugs of India, XXIII. 326.
Wax figures, XXIV. 460.
Spinning in old times, XXIV. 730.
Egyptian, Greek, and Roman months, IV. 665.
Wild horses of India, XII. 741.
The roc (monster bird of the *Arabian Nights*), XX. 611.
The honey guide (a curious little bird), XII. 139.
The cockatrice, VI. 98.
The hunters and the glutton, X. 696.
The ichneumon, XII. 629.
The custom of April Fool, II. 214.
May-day customs in old times, XV. 647.
The Nile festival in Egypt, VII. 727.
The ordeal of fire in the Middle Ages, XVII. 820.
Deodands, VII. 100.
The divining-rod, VII. 293, and XI. 549.
The automaton, III. 142.
The hornbook, XII. 170.
The diving-bell, VII. 294–300.
Balloons, I. 187.

Every young person likes to read about heroes and deeds of heroism. The *Britannica* tells of a great number. A very interesting course of reading may be made up from the following and similar subjects:

Heroes.

Leonidas, king of Sparta, who with three hundred men, defended a mountain pass against the entire Persian army, XIV. 462.

Cincinnatus, who was called from his plough to be dictator of Rome, V. 784.

Horatius Cocles, who defended the bridge across the Tiber, and thus saved Rome, VI. 100.

Regulus, the Roman who suffered death rather than break his word, XX. 348.

William Tell, the mythical hero of Switzerland, XXIII. 155.

Arnold Winkelried, the Swiss patriot, XXIV. 612.

Jeanne D'Arc, the heroine who saved France from the English, XIII. 695; IX. 550.

Captain John Smith, famous in the early history of Virginia, XXII. 173; XV. 301.

Garibaldi, the Italian patriot, sup. 1368.

Then there are scores of interesting articles about kings, warriors, and statesmen, some of which you will want to read. The following are examples:

Kings and Warriors.

Alexander the Great, I. 480.
Hannibal, the Carthaginian general, XI, 441.
Julius Cæsar, the greatest of the Romans, IV. 633.
Tamerlane the Tartar, XXIII. 399.
Charlemagne, V. 402.
Alfred the Great, I. 506.
William the Conqueror, XXIV. 574.
Richard Cœur de Lion, XX. 539.
Peter the Great of Russia, XVIII. 698.
George Washington, XXIV. 387.
Napoleon Bonaparte, XVII. 192.

Or, if you would read of discoverers and adventurers, see such articles as these:

Prince Henry the Navigator, XI. 672.
Columbus, VI. 171.
Hernan. Cortes, VI. 441.

Francisco Pizarro, XIX. 159.
Ferdinand Magellan, XV. 197.
John and Sebastian Cabot, IV. 622.
Discoverers and Adventurers. Sir Francis Drake, VII. 389.
Vasco da Gama, X. 57.
Captain Cook, VI. 330.
Henry Hudson, XII. 332.
Ibn Batuta (14th century), XII. 607.
Marco Polo, XIX. 404.
African Explorations, I. 245.
Henry M. Stanley and the recent discoveries in Africa, sup. 2777.
Arctic Explorations and Discoveries, II. 133.
Sir John Franklin, IX. 719.
Martin Frobisher, IX. 791.
Australian explorers, III. 104.
Captain Kidd, sup. 1788.

Then aside from this mere reading for pleasure or ordinary information, you will want to learn from time to time how a great many things are done. The *Britannica* will help you. For example, notice the following:

How to do Things.

How to make liquid glue, X. 134 a.
How to do gold gilding, X. 594 a.
How to tie knots, XIV. 128 a.
How to make gold lacquer for brass work, XIV. 194 a.
How to make snow-shoes, XXII. 201 b.
How to make photographs, XVIII. 214 b.
How to do sleight of hand tricks, XIV. 414.
How to collect butterflies, IV. 597 b.
How to make putty, XX. 18.
How to build an ice house, XII. 615 a.
How to shoe a horse, XXI. 831, 832.

How bells are made, III. 537 a.
How matches are made, XV. 624.
How to do with a magic lantern, XV. 211.
How nets are made, XVII. 359.
How to make flies for trout fishing, II. 40.
How pins are made, XIX. 97.
How a marble statue is made, XXI. 571.
How to make a canoe, IV. 811.
How to rig a ship, XXI. 593.
How to care for hunting hounds, XII. 315.
How to make bows and arrows, II. 376 a.
How to catch fish with a hook, II. 32.
How to make a bull-roarer, sup. 617.
How carrier-pigeons are trained, sup. 710.

And now don't you begin to see what a vast amount of entertaining and useful knowledge lies before you in these volumes, ready for you to use when you choose?

In the chapters that are to follow, an effort will be made to classify a few of the subjects which will be of most interest to you. In this way the GUIDE hopes to help you to a still further and more intimate acquaintance with the contents of the *Britannica*. If you once acquire the habit of consulting it, you will find it a trustworthy friend, ready to answer your questions and willing to help you on all occasions.

The Index volume of the *Britannica* will be of great assistance to you in making references to any of the other volumes. When you want to find out anything about a given subject, it is often a good plan to turn at once to that volume. If you do not know how to use the Index, refer now to page 16 of this GUIDE, and read the directions that are given there.

CHAPTER II.

HOME READINGS IN HISTORY.

"The use of reading is to aid us in thinking."—*Edward Gibbon.*

TO KNOW one thing well is better than to have a smattering of many things. It is an excellent plan to choose for yourself some particular subject which you like, and then to follow a systematic course of reading on that subject until you have acquired a comprehensive knowledge of it. Some of you will prefer history, some of you biography (which is really a branch of history), some of you science, and some of you art. In beginning such a course read that which you can readily understand; you will gradually become able to understand and enjoy things which now seem very hard and totally unintelligible to you. It is not intended that a course of this kind should take the place of the miscellaneous reading which you will want to do — of the stories, the poems, the sketches, the many excellent and beautiful things in literature which every intelligent boy or girl takes delight in reading. The aim and object of this course is to add to your knowledge, to aid you in thinking, to help you to become an intelligent man or woman. Having once decided to begin it, resolve that nothing shall induce you to neglect it. Devote a little time to it regularly. If you give ten minutes every day to systematic reading—and you need not give more—you will be astonished at the end of a year to note how many things you have learned. But if you find the reading pretty difficult now and then, you must not give up on that account.

Courses of Reading.

The hardest reading is very often the most profitable—provided always that we make ourselves the masters of it.

There are a great many articles in the *Britannica* which may be utilized in courses of reading of this kind. If the *Britannica* is the only book to which you have access, these articles may be made to comprise a complete course in themselves. But if there are at hand other books on the same subject, then the readings from the *Britannica* may be made to supplement your study of these other authorities. For instance, let us suppose that you have undertaken to learn all that you can about United States History. Perhaps you have studied a text-book on that subject at school. Did it seem dull and dry to you? Perhaps the writer has made it so by trying to compress a great amount of information into a very small space. He has given a large number of dates and names, and you have been expected to learn these and remember them.

What is History?

But history in the true sense of the word is a good deal more than dates and names. It is a fascinating story, and people read it because of the pleasure which it gives no less than for the profit which may be derived from it. Take now your school history and supplement the lessons which it contains with readings from the following articles in the *Britannica:*

Discoverers and Colonists.

The story of Columbus, VI. 171.

The life of Cortes, the conqueror of Mexico, VI. 441.

The life of Pizarro, the conqueror of Peru, XIX. 159; and a particular account of his exploits in Peru, XVIII. 677.

The life of Balboa, the discoverer of the Pacific Ocean, III. 273; and a particular account of his great discovery, X. 182.

The life of De Soto, the discoverer of the Mississippi, VII. 131.

The life of Sir Francis Drake, the first Englishman who sailed round the world, VII. 389.

The life of Sir Walter Raleigh, the great admiral, statesman, and courtier, XX. 262.

The life of Captain John Smith, who figures so prominently in the story of the settlement of Virginia, XXII. 173.

The story of Pocahontas, the Indian princess, XXII. 175.

The story of the Pilgrim Fathers, XII. 726.

The account of the Dutch settlers in New York, XVII. 454.

The life of William Penn, the Quaker founder of Pennsylvania, XVIII. 492.

The story of Marquette, the French explorer, XV. 565.

The life of La Salle, who rediscovered the Mississippi, XIV. 318.

The story of Pontiac, the Indian chief, XVIII. 504.

The life of General Wolfe, the hero of Quebec, XXIV. 630.

Great Americans.

The life of Washington, XXIV. 387.

The life of Franklin, America's first philosopher, IX. 711.

The life of Patrick Henry, XI. 676.

The life of John Adams, I. 141.

The life of Thomas Jefferson, XIII. 613.

The story of the Declaration of Independence, XXIII. 743.

The life of Lafayette, XIV. 201.

The life of General Greene, XI. 163.

The story of Benedict Arnold, XXIII. 744, 787.

The life of Cornwallis, VI. 428.

An account of Aaron Burr, XI. 413.

The life of Alexander Hamilton, XI. 412.

And now, if you wish to continue your historical readings to the present time, you may do so by reading the

biographies of the Presidents who have not been named in the list above:

The Presidents.

James Madison, XV. 182.
James Monroe, XVI. 760.
John Quincy Adams, I. 142.
Andrew Jackson, XIII. 533.
Martin Van Buren, XXIV. 56.
William H. Harrison, XI. 495.
John Tyler, XXIII. 674, 766.
James K. Polk, XIX. 401.
Zachary Taylor, XXIII. 96.
Millard Fillmore, IX. 165.
Franklin Pierce, XIX. 81.
James Buchanan, IV. 413.
Abraham Lincoln, XIV. 658.
Andrew Johnson, XIII. 719.
Ulysses S. Grant, XXIII. 788, 776; also sup. 1442.
Rutherford B. Hayes, XXIII. 784; also sup. 1554.
James A. Garfield, sup. 1368.
Chester A. Arthur, sup. 250.
Grover Cleveland, sup. 831.
Benjamin Harrison, sup. 1532.
William McKinley, sup. 1959.

By the time you have read all these biographies you will have acquired such a knowledge of American history as will be of value to you as long as you live. But to some of you this course may seem hard, dry reading. If so, it will be no trouble to suggest another—a very different one, which all boys who are fond of the sea and not afraid of a little history will turn to with pleasure.

NAVAL HISTORY.

Ships in former times were very different from those which sail the sea nowadays. Read of the first invention

of boats and ships in volume XXI., page 804. Among the earliest war ships of which we have any account are the Greek and Roman triremes, described on page 806 of the same volume. In the article on the NAVY, XVII. 279, there is an interesting account of the early war ships used by the English. King Henry VIII. is said to have laid the foundation of the British navy, and the largest ship of his time, the *Great Harry*, is described, XVII. 281. Queen Elizabeth called together the greatest naval force that had ever been known, in order to oppose the Invincible Armada of Spain. The story of the ARMADA and of its notable defeat is told in an interesting article on page 543 of volume II. And in this connection you will want to read about Sir Walter Raleigh, XX. 262, about Sir Francis Drake, VII. 389, and about Sir John Hawkins, XI. 535.

Ships.

But it is not expected that this course of reading shall be exhaustive; and so you may turn now to the life of Nelson, XVII. 321; to the battle of the Nile, I. 52; and to the Battle of Trafalgar, VI. 146.

Next, read about our own naval heroes:

Paul Jones, XIII. 738.

Commodore Decatur, XXIII. 759 also sup. 1008.

Commodore Perry, sup. 2351.

Admiral Farragut, IX. 41.

Finally, by way of concluding this brief course of reading, you will find it profitable to learn all that you can about the UNITED STATES NAVY, XVII. 300, and particularly our new navy, its wonderful armament and its estimated strength, sup. 2145–2153.

THE ROMANCE OF HISTORY.

1. There are many things connected with the history of the Middle Ages which give to it the charm of romance.

We never tire of reading about the KNIGHTS of chivalry, XIV. 110; about the CASTLES in which they lived, V. 197; about the TOURNAMENTS which they held, XXIII. 489; and about the CRUSADES in which they engaged, VI. 622.

Tales of Knighthood.

Next, let us read the legend of Roland, the peerless knight of France, XX. 626; the history of Richard the Lion-hearted, XX. 539, and particularly of his exploits in Palestine, VI. 628; the story of the English outlaw, Robin Hood, XX. 605; the account of Godfrey of Bouillon, VI. 624; the history of the Children's Crusade, VI. 627; and finally, the story of Chevalier Bayard, the knight "without fear and without reproach," III. 457.

When you have mastered this course of reading, you will have a better knowledge of mediæval life and manners and traditions than you could ever have acquired merely by studying an ordinary text-book at school.

2. A second course—equally interesting, but somewhat harder, and, therefore, suited to older readers—may be taken from ROMAN HISTORY. Read the legendary story of Romulus, the reputed founder of the city, XX. 840; the mythical tale of the Horatii and Curiatii, XII. 160; the account of Horatius Cocles, the hero who kept the bridge, VI. 100; of brave Regulus, who never broke his word, XX. 348; of Cincinnatus, called from his plough to defend his country, V. 784; of Cornelia, the mother of the Gracchi, VI. 421; of the Gracchi themselves, and of their services to their country, XI. 25; of Hannibal, the Carthaginian hero, XI. 441; and of Cæsar, IV. 633, and Pompey, XIX. 451. and the downfall of the Roman republic, XX. 763.

Stories of Rome.

3. The third course is not historical, but entirely mythical or legendary, and yet there is, doubtless, some sort of

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historical basis for it. It relates to the story of the TROJAN WAR—an event immortalized by Homer, the first of the poets, and made the subject of many a tale and poem and tragic drama from his time until now. As the basis and starting-point of this course, read the Legend of Troy, XXIII. 582; then refer to the following articles in their order:

Story of Troy.

Paris, whose perfidy was the cause of the war and the ultimate ruin of his country, XVIII. 295.

Helen of Argos, the most beautiful woman in the world, XI. 629.

Menelaus, the wronged husband of Helen, XVI. 10.

Agamemnon, "king of men" and leader of the Grecian forces, I. 273.

Odysseus, the wily hero, chief actor in Homer's Odyssey, XVII. 729.

Achilles, whose wrath and. its consequences form the subject of the Iliad, I. 94.

Hector, the bravest and ablest of the Trojan chiefs, XI. 609.

Ajax Telamon and Ajax Oïleus, typical heroes and leaders of the Greeks, I. 432.

And now, if you have become interested in stories of this kind, turn to chapter XX. in this GUIDE and find there an extensive list of Greek legends and other romantic tales, all of which are narrated with more or less fulness in the pages of the *Britannica.*

CHAPTER III.

HOME READINGS IN BIOGRAPHY.

"Lives of great men all remind us,
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sands of time."
—*Longfellow.*

THE biographies of great, and especially of good men, will always be found instructive and useful to the young. Some of the best are almost equal to gospels. They teach high living, high thinking, and energetic action. They show what it is in the power of each to accomplish for himself. No young man can rise from the perusal of such lives without feeling his whole mind and heart made better, and his best resolutions strengthened. They increase his self-reliance by fortifying his views and elevating his aims in life. Sometimes, too, a young man discovers himself in a biography, as Correggio felt within him the risings of genius on contemplating the works of Michael Angelo. "And I, too, am a painter!" he exclaimed. Benjamin Franklin was accustomed to attribute his usefulness and eminence to his having in youth read a work of Cotton Mather's. And Samuel Drew avers that he framed his own life, and especially his business habits, on the model left on record by Benjamin Franklin. Thus, it is impossible to say where a good example may not reach, or where it will end, if indeed it have an end.

Uses of Biography.

But, to be more precise, it may be well to name a few

biographies that will illustrate the more desirable elements of character. For instance, the most striking lessons of

DILIGENCE, APPLICATION, AND PERSEVERANCE

are to be found in the lives of certain famous men about whom no one can afford to be ignorant. Read, therefore, the following biographical sketches:

Men of Diligence.

Benjamin Franklin, the studious printer's apprentice, who became the first philosopher of America, IX. 711.

Washington Irving, the "father of American literature," XIII. 372.

Arthur Wellesley, Duke of Wellington, the leader of the victorious armies at Waterloo, XXIV. 493.

Michael Faraday, the distinguished scientist, IX. 29.

James A. Garfield, the canal-boy, who became President of the United States, sup. 1368.

Richard Cobden, the English political economist and reformer, VI. 85.

Hugh Miller, the stone-cutter of Cromarty, who attained distinction in both science and literature, XVI. 318.

Sir Isaac Newton, the son of a small farmer, who through his industry became the foremost philosopher of modern times, XVII. 438.

Buffon, the French naturalist, who declared that "genius is patience," and whose rule was to turn every moment to account, IV. 444.

Dr. Jenner, the discoverer of vaccination, XIII. 622; XXIV. 23.

Daguerre, the inventor of the daguerreotype, and the real founder of the art of photography, VI. 761.

Gainsborough, the son of a cloth-worker, who became one of the greatest of English painters, X. 15.

General Grant, who rose from obscurity to be one of the most successful military leaders of modern times, sup. 1442.

Then there have been men who, in the face of

POVERTY, SICKNESS, OR DISASTER,

won their way to success and distinction. Read the story of their lives, and learn that, to the boy or man of determination and will, there is no such thing as failure. Among scores of such men, it is necessary to mention only a few.

Men of Determination.

Palissy, the potter, whose life reads like a romance, XVIII. 186.

Galileo, who continued his scientific pursuits even after blindness and old age had come upon him, X. 30.

Elihu Burritt, "the learned blacksmith," who, in the odd moments of his business, made himself the master of forty languages, sup. 633.

Thomas Carlyle, the son of a mason, who, by his own perseverance, became one of the most famous men of modern times, sup. 701.

John Bunyan, who wrote the "Pilgrim's Progress" while in prison, and at the same time supported his family by making tag laces, IV. 526.

Sir Richard Arkwright, who worked his way from a barber's shop to be the inventor of the spinning jenny and the founder of the cotton industry in Great Britain, II. 540.

Samuel Drew, who rose from the shoemaker's bench to be a distinguished essayist and preacher, VII. 469.

Sir Humphry Davy, the distinguished philosopher, who worked his way up from the position of a country apothecary, VI. 845.

George Stephenson, the colliery engine-man, who invented the railway locomotive, XXII. 537.

Matthew Boulton, "the father of Birmingham," IV. 172; XXIV. 413.

Andrew Johnson, the tailor's apprentice, who became President of the United States, XIII. 719.

For examples of

ENERGY, PROMPTITUDE, AND HARDIHOOD,

look into the biographies of such men as the following:

Men of Energy.
Napoleon Bonaparte, XVII. 192.
Peter the Great, XVIII. 698.
Saladin, XVI. 588.
Francis Xavier, XXIV. 716.
Lord Clive, VI. 8.
Oliver Cromwell, VI. 597.
Andrew Jackson, XIII. 533.
Robert E. Lee, XIV. 399.
Henry M. Stanley, sup. 2777.

For interesting illustrations of the manly qualities of

PATIENCE AND FORTITUDE UNDER REVERSES,

study the lives of such noted men as

Men of Patience.
Christopher Columbus, VI. 171.
John Hampden, the English patriot, XI. 428.
Dante, the great Italian poet, VI. 809.
Sir Walter Raleigh. XX. 262.
Louis Kossuth, the Hungarian patriot, sup. 1806.

James Watt, the inventor of the steam engine, XXIV. 412.

James Audubon, the famous American ornithologist, III. 70.

Sir Austen H. Layard, the discoverer and excavator of the ruins of Nineveh, sup. 1847.

William Harvey, the discoverer of the circulation of the blood, XI. 502.

Claude Lorraine, the pastry-cook's apprentice, who became one of the most distinguished of the painters of France, V. 814.

John Flaxman, the famous English sculptor, IX. 298.

If you would like to read of pleasant instances of

CHEERFULNESS AND EQUANIMITY OF TEMPER

under every variety of fortune, turn to the lives of men like

Men of Cheerfulness.

Dr. Samuel Johnson, XIII. 719.
Oliver Goldsmith, X. 760.
Sydney Smith, XXII. 177.
Lord Palmerston, XVIII. 193.
Abraham Lincoln, XIV. 658.

Very interesting and valuable also are those lessons of

INTEGRITY AND UPRIGHTNESS OF PRINCIPLE

that are shown in the careers of

Men of Integrity,

Diogenes, the Greek philosopher, VII. 245.
Edmund Burke, the English orator, IV. 538.
Dr. Thomas Arnold, head master of the school at Rugby, II. 626.
Sir Thomas More, the English statesman, XVI. 815.
John Howard, the philanthropist, XII. 319.
William Chambers, the Scottish publisher, V. 380.
Loyola, the founder of the society of Jesuits, XV. 31.
William Wilberforce, the opponent of the slave trade, XXIV. 565.
"Stonewall" Jackson, the Confederate general, XIII. 534.

If you would learn of the rewards which follow

METHOD, PRECISION AND PAINSTAKING,

read the biographies of

Men of Precision.

Nicholas Poussin, the French painter, XIX. 649.
Michael Angelo, the great Italian artist, XVI. 229.
Baron Cuvier, the French naturalist, VI. 740.
Titian, the Italian painter, XXIII. 413.
William Wordsworth, the poet of nature, XXIV. 668.
Lord Brougham, lord chancellor of England, IV. 373.
Alexander Pope, XIX. 481.
William Cecil, Lord Burghley, Queen Elizabeth's prime minister, V. 283.
Benjamin Disraeli, Lord Beaconsfield, VIII. 367.

And for the supreme lessons of purity of life and

NOBILITY OF MOTIVE

examine the lives of such men as

Men of Noble Motives.

Abraham Lincoln, XIV. 658.
General Lafayette, XIV. 201.
William Lloyd Garrison, X. 85.
Horace Greeley, XI. 160.
John G. Whittier. sup. 3146,

and other illustrious persons of our own and foreign lands.

Some we have here named might be catalogued, indeed, as types of every excellence that should adorn human character. Such are our own Washington and Benjamin Franklin, but even the youngest student will see how hard it is to attempt a biographical classification on these lines.

Most boys are ambitious. They wish to grow up to become men of influence and renown. Many of them lose this ambition because they are unwilling to wait long enough, work hard enough, and be sufficiently patient in well-doing.

"The heights by great men reached and kept
Were not attained by sudden flight,"

And yet there have been many great men who displayed their abilities at a very early age. Perhaps you would like to read about some of these

GREAT YOUNG MEN.

Handel composed a set of sonatas when he was ten years old, XI. 433.

Haydn composed a mass at thirteen, XI. 541.

Mozart composed his first opera at twelve, XVII. 8.

Musicians.

Beethoven's music was beaten into him, but he composed three sonatas when thirteen, III. 504.

Cherubini composed a mass at thirteen, V. 587.

Paganini was a great violinist at eight, XVIII. 134.

Charles Wesley, the great hymn writer, played the harpsichord when he was a babe, XXIV. 504.

Michael Angelo finished his great marble statue of "David" before he was twenty, XVI. 229.

Raphael was an eminent artist at seventeen, XX. 274.

Artists.

Canova modelled a lion out of butter when only four years old, V. 24.

Sir Edward Landseer painted one of his greatest pictures at sixteen, XIV. 280.

Cervantes had written several romances before he was twenty, V. 347.

Goethe could write in five languages when he was eight, X. 721.

Victor Hugo wrote his first tragedy when fifteen years old, IX. 676.

Authors.

Alexander Pope wrote his *Pastorals* when only sixteen, XIX. 481.

Chatterton, who died before he was eighteen, was already a great poet, V. 445.

Burns began to rhyme at sixteen, IV. 566.

Thomas Moore wrote verses at thirteen, XVI. 805.

Shelley published *Queen Mab* when eighteen, XXI. 789.

Southey wrote *Joan of Arc* when nineteen, XXII. 289.

Mrs. Browning wrote poems at ten, IV. 391.

Tennyson wrote his first volume of poems before he was eighteen, sup. 2877.

Sir Isaac Newton displayed wonderful ability when a mere child, XVII. 438.

Philosophers.

Blaise Pascal wrote a treatise on Conic Sections when he was sixteen, XVIII. 333.

Grotius wrote Latin verses when he was eight, XI. 217.

Haller composed a Chaldee grammar at twelve, XI. 396.

Lord Bacon planned his *Novum Organum* before he was sixteen, III. 200.

Sir Christopher Wren invented an astronomical instrument at thirteen, XXIV. 689.

William Pitt, the younger, entered Parliament when he was twenty-one, XIX. 134.

These were some of the great young men of modern times. Ancient history furnishes us with other examples of men to whom

SUCCESS CAME EARLY IN LIFE:

Themistocles, who won his greatest victory at the age of thirty, XXIII. 250.

Alexander the Great, who died at thirty-one, I. 480.

Young Warriors.

Pompey, who was a successful Roman general at twenty-three, XIX. 450.

Hannibal, who, when only twenty-six, was made sole commander of the Carthaginian army, XI. 441.

Charlemagne, who was master of France and Germany at thirty, V. 402.

Marshal Saxe, who began his military career at twelve, XXI. 346.

Charles XII. of Sweden, who became king at the age of fifteen, V. 420.

This list might be easily extended; but here is reading enough for several winter evenings. And when you have finished it, you will be at no loss to determine whether these men attained distinction at a single bound or whether they did not rather win by hard and patient labor, begun while they were very young. Greatness comes to no man simply because he wishes it. It is the reward of determined effort.

CHAPTER IV.

HOME READINGS IN SCIENCE.

"To neglect all the abiding parts of knowledge for the sake of the evanescent parts is really to know nothing worth knowing."—*Frederick Harrison.*

THE subject of history is not equally attractive to all young people. There are some who would prefer to read of the great world of nature, and for these it would be easy to name very many *Britannica* articles which would prove interesting and instructive. Now, here is a course of readings in natural history arranged in twelve divisions, each of which can be easily completed in a month. You will find some of the articles very interesting indeed, while others, perhaps, will seem rather hard and at first not so easy to understand. But if you begin on this course and hold to it for a year, you will find not only that you have gained a great deal of information, but that the reading of these various articles has increased your capacity for deriving the highest pleasure from the perusal of books.

Natural History.

READINGS IN NATURAL HISTORY.

I. BEASTS.

The Elephant, VIII. 122.
The Giraffe, X. 618.
The Beaver and its habits, III. 475.
Monkeys, II. 148.

The Chameleon, V. 381.
The Tiger, XXIII. 385.

II. CURIOUS BIRDS.

The Albatross—the famous bird of the South Seas, I. 448.
The Dodo—a strange bird now no longer in existence, VII. 321.
The Cormorant—how it is taught to catch fish. VI. 407.
The Dove, VII. 379.
Migration of Birds, III. 765.
The Nightingale, XVII. 498.
The Stork, XXIII. 577.

III. FISHES.

The Shark, XXI. 775.
The Swordfish, XXII. 804.
Mackerel, XV. 159.
Codfish, VI. 103.
Cuttle-fish, VI. 735. Goldfish, X. 759.

IV. REPTILES.

Special article, XX. 432.
Rattlesnake, XX. 293.
Cobra, VI. 90. Anaconda, I. 788.
Boa Constrictor, III. 841.
Tortoise, XXIII. 455 (illustrated).
Crocodile, VI. 592. Alligator, I. 585.

V. INSECTS.

Habits of Ants, II. 94 a.
Slaveholding Ants, II. 97 a.
White Ants of Africa, II. 99 a.
Bees and their Habits, III. 484.
An interesting description of Spiders, II. 297.

The Mantis—the curious "subject of many wide-spread legends," XV. 503.

VI. EXTINCT ANIMALS.

The Mammoth (illustrated), XV. 447.
The Megatherium (illustrated), XV. 829.
The Plesiosaurus, XIX. 220.
The Pterodactyl, XX. 86.

VII. FABLED ANIMALS.

The Dragon, VII. 385.
The Cockatrice, VI. 98.
The Griffin, XI. 195.
The Chimæra, V. 626
The Phœnix, XVIII. 810.
The Roc, XX. 611.

VIII. DOMESTIC ANIMALS.

History of the Horse, XII. 172.
The Arabian Horse, II. 240.
The Camel, IV. 735.
Dogs (an illustrated article), VII. 324.
Cats, V. 202.
The Cow, I. 390.

IX. SEA ANIMALS.

Life in the Ocean, VII. 276–281.
Whales and whale fishing, XXIV, 523.
Seals and seal fishing, XXI. 580.
The Walrus (illustrated), XXIV. 337.
The Dolphin, VII. 346.
Corals, VI. 369.

X. COMMON INSECTS.

The Housefly, XII. 317.
The Humble-bee, XII. 342.
Beetles, VI. 126.
Gnats, X. 700.
Mosquitoes, XVI. 866.
Butterflies, IV. 592.

XI. BARNYARD FOWLS.

Chickens, IX. 491.
Turkeys, XXIII. 657.
Geese, X. 777.
Ducks, VII. 505.
Pigeons, XIX. 84.
Eggs of Birds, III. 772.

XII. MISCELLANEOUS.

Special article on birds, III. 699.
Special article on insects, XIII. 141.
Animals of Asia, II. 695.
Animals of Africa, I. 258.
Animals of America, I. 681.
Article on Amphibia, I. 750.

Of course this list might have been made very much longer—for the *Britannica* contains hundreds of such articles. But the above will be sufficient to start with, and, as you proceed with your reading, other subjects will naturally suggest themselves which you will be able to find from the Index volume without any further help from the GUIDE.

CHAPTER V.

GAMES, SPORTS, AND PASTIMES.

"Up! up! my friend, and quit your books,
Or surely you'll grow double:
Up! up! my friend, and clear your looks;
Why all this toil and trouble?"—*Wordsworth.*

THIS would be but a dull world if everybody worked all the time, and never took any recreation. And the *Encyclopædia Britannica* would be a dull book if it were filled entirely with information about the different branches of scientific knowledge, and said nothing at all about the games, sports, and pastimes which amuse our leisure hours and add to the enjoyableness of life. But from these volumes you can learn how to play, as well as how to work. Every game of any importance, every pastime that is of general interest receives its proper notice.

Work and Play.

OUTDOOR GAMES.

The game of BALL has been a favorite pastime of all ages and nations. Read the article on that subject, sup. 327.

Do you want to know all about BASE-BALL, its history, the rules which govern the game, etc.? Turn to volume III., page 406, and you will find there a brief but comprehensive article on that subject, which every boy will want to study; and this is continued in a supplementary article, sup. 370, which gives a complete history of the game since its first

Games of Ball.

introduction in 1857 to the present time. In this latter article will be found the rules which govern its playing in America.

The English national game of CRICKET is treated with equal fulness in VI. 578. See also William G. Grace, sup. 1434. The leading articles on both cricket and base-ball contain not only the rules most generally recognized for the government of the games, but carefully drawn diagrams of the fields, and full directions for playing.

Next to base-ball, football claims the greatest attention in this country. Indeed, it would be difficult to say which is the leading favorite. The article on AMERICAN FOOTBALL, sup. 1301, contains the very latest rules regulating this exciting game. A history and general notice of football as it was formerly played may be found in IX. 367.

ARCHERY is the subject of an extremely interesting article, II. 371. From that article you may learn not only the history of bows and arrows, but how to make them (II. 376), and also the rules which govern the popular pastime of archery (II. 377).

Outdoor Games.

Other outdoor games of almost every kind are described with like completeness :

Golf, X. 765.
Lacrosse, XIV. 195.
Bowls, IV. 179.
Ten-pins, IV. 180 b'''.
Croquet, VI. 608 b.
Quoits, XX. 189.
Curling, VI. 712.
Billiards, III. 674.
Rackets, XX. 549.
Polo, XIX. 403.
Tennis, XXIII. 179.

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INDOOR GAMES.

All kinds of indoor games are also described, together with minute directions for playing them. The article on CHESS, V. 592, is interesting for its historical information. The modern changes of style in playing chess are noted in sup. 778. The article on DRAUGHTS (commonly known in this country as checkers), VII. 444, and that on Backgammon, III. 197, are equally entertaining and instructive. Then there are the various games at cards, all of which are described in the *Britannica*.

Indoor Games.

Casino, sup. 717.
Bezique, III. 623.
Cribbage. VI. 575.
Ecarté, VII. 620.
Euchre, VIII. 654.
Loo, XV. 1.
Napoleon, XVII. 229.
Picquet, XIX. 114.
Poker, XIX. 282.
Whist, XXIV. 543.

Among other indoor pastimes we may mention Riddles, XX. 549.

Legerdemain, or sleight of hand, XIV. 414; XV. 207.

SPORTS.

Few sports are more attractive to boys and men than fishing; and to all who are partial to this kind of amusement, the article on Angling, II. 32, will prove both interesting and instructive. It contains a great deal of information about fish and the art of taking them with hooks. The life of quaint old Izaak Walton, the most famous of fishermen, should be read in this connection, XXIV. 342.

Fishing.

Most boys, even though they are debarred of such sports themselves, like to read about hunting; and so they will derive much pleasure from the general article on that subject, XII. 392. Here, too, they may learn about the care of fox-hounds, XII. 315; about fox-hunting, XII. 395; and about horsemanship in the chase, XII. 195. There is more of the same kind of reading in VII. 328, 330, where a good deal of information is given about sportsmen's dogs, such as the pointer, the setter, and the retriever.

Hunting.

Closely related to these sports is the pleasant pastime of rowing or sailing on the water. Several articles now claim our attention. As for rowing, read what is said further on that subject in XX. 619. An account of intercollegiate boat-racing is given in sup. 2584. The article on canoeing, IV. 811, is full of practical information. Row-boats are described further over, in XXI. 825. The article on Yachting, XXIV. 722–725, is very complete, and is full of historical interest. Practical directions for swimming and diving are given in XXII. 768, and these will repay you for all the time spent in their study. Skating, XXII. 104, is another instructive and interesting article.

Rowing.

Everybody, nowadays, rides a bicycle; and so everybody will want to read its history, III. 665. A complete description of bicycle manufacture in the United States may be found in sup. 458–460. The laws regarding bicycles and bicycle riders are noticed in sup. 461. Then in sup. 1848 there is a brief history of the organization called the League of American Wheelmen, which every bicycler will read. What bicycles have done for good roads is related in sup. 2557.

ATHLETIC SPORTS, ETC.

While learning about the games and sports of our own

times it is but natural that we should wish to know how the people of former ages amused themselves, and how they trained their bodies, and cultivated their strength. Here then, to begin with, are a few of the many articles or parts of articles relating to this subject:

In Greece and Rome.

Greek games, X. 63; Olympian games, sup. 2251. The revival of these sports at Athens in the summer of 1896 lends much additional interest to the chapters describing them. Read then the following additional references to the Olympian games, V. 711; VIII. 140; XI. 94; XVII. 766.

Athletæ, III. 11.
Gymnasium, XI. 347.
Roman games, X. 65.
Gladiatorial games, X. 632.
Secular games at Rome, XXI. 618.
The Amphitheatre, I. 774; XX. 830.
The Collosseum, II. 419.
Roman circus, V. 791; XX. 829.
Chariot races, X. 64.
Wrestling, X. 64.

In the middle ages the most popular of all amusements were those connected with tournaments, the history of which is pleasantly narrated in XXIII. 489. The knights who engaged in these contests at arms, often found amusement of a lighter character in following the chase in the manner described in XII. 393. The rearing and training of hawks for hunting purposes was called *falconry*, and this is the subject of an interesting article in IX. 6–12.

Athletic Training.

And now, approaching our own times, read the two articles on Athletic Sports, III. 12, and sup. 279. Both are full of valuable information, especially regarding

physical culture. They are so full and exhaustive that some of the youngest readers may not care to read them throughout; and yet it will pay to get as many useful hints, and suggestions from them as you can.

The article on Athletic Training and Apparatus, in the supplements, presents the very latest facts and the opinions of the best authorities on this subject.

The article on Gymnastics, XI. 348, presents some interesting statements with reference to the training of the body by systematic exercises. The best methods of dieting while attempting to improve one's strength by physical training are adequately described in VII. 200.

See, now, Calisthenics, sup. 658, and Delsarte System, sup. 1022.

PART II.

THE STUDENT.

CHAPTER VI.

THREE COURSES OF READING IN HISTORY.

"History is philosophy teaching by examples."—*Bolingbroke.*

THE entire history of man, from the earliest times to the present, will be found in the *Encyclopædia Britannica.* Many of the articles on historical subjects are chiefly valuable for purposes of reference, while others are extremely interesting when read in course, and if taken up and studied systematically will give to the student a mastery of the subject which he could not well acquire from any similar work.

It is proposed in this chapter to indicate three distinct courses of reading, any one of which can be pursued independently of the others. In laying out these courses the aim has been to select from the great abundance of material in the *Britannica* such portions as are essential to an understanding of the march of events, and to pass lightly over those periods of history which have been unprolific of events of general and permanent interest.

I. AMERICAN HISTORY.

The article AMERICA, I. 669, contains a section of twenty pages devoted to ancient America. This will serve as an excellent introduction to the course of study upon which we have entered. Here you will find a full account of the aborigines, page 686; their languages, page 688; their tribal organization, page 690; the ancient remains of the Mis-

Ancient America.

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sissippi valley and other localities, page 691; an account of the native civilization, page 694; and a very interesting résumé of the curious traditional history of Central America. In the articles MEXICO, XIV. 206, and YUCATAN, XXIV. 759, there is a still fuller exposition of this subject. In the article PERU, XVIII. 676, the remarkable civilization of the country of the Incas is described in a manner that is both pleasing and instructive.

The Discovery.

It is still, in certain respects, a debated point as to who was the real discoverer of America. In the article AMERICA, I. 706, a full account is given of the voyages of the Northmen to the shores of North America, and following this, we have the story of Columbus and his discoveries. Turn now to the biography of Columbus, VI. 170. Read, also, the life of Sebastian Cabot, IV. 622, and that of Amerigo Vespucci, XXIV. 192, who, by a singular fortune, gave his name to the New World. The conquest of Mexico is well told in the article CORTES, VI. 441, and that of Peru in the article PIZARRO, XIX. 159.

THE UNITED STATES.

General Views.

Begin with the article UNITED STATES, XXIII. 729. The first part of this article, containing seventy-two pages, embraces a history of our country which is not only more complete, but far more readable than most of the school text-books on this subject. To add to the value of the article, it is illustrated with several maps:

1. A map of the English colonies.
2. A map showing the territorial growth of the United States from 1776 to 1887.
3. A map of the United States corrected to date.

A brief analysis of this article will show us what additional subjects may be brought in by way of collateral reading.

In connection with the history of VIRGINIA, XXIV. 255, read the following articles or parts of articles:

Virginia.

Sir Walter Raleigh, XX. 262.
John Smith, XXII. 173.
History of Tobacco, XXIII. 423 (one column).

Introduction of Slavery into America, XXII. 137 (beginning with "Spanish Colonies," second column, and ending at the bottom of page 138).

In connection with NEW ENGLAND, XXIII. 729, read about the Puritans, VIII. 340–346, 376–378; the Pilgrim Fathers, sup. 2387; and Roger Williams, XXIV. 586.

Northern Colonies.

In connection with Pennsylvania, XXIII. 730, read about William Penn, XVIII. 494.

With the REVOLUTIONARY WAR, XXIII. 739, we reach the period of those great men whom we justly style "the fathers." Let us read the biographical sketches of a few of these makers of the nation:

The Revolution.

George Washington, XXIV. 387.
Patrick Henry, XI. 676.
Thomas Jefferson, XIII. 613.
John Adams, I. 141.
James Madison, XV. 182.
James Monroe, XVI. 760.
Alexander Hamilton, XI. 412.

These articles will help us to understand not only the period of the Revolution, but the equally important periods which followed—the formation of the FEDERAL CONSTITUTION, XXIII. 744, and the beginnings of the government under the Constitution, XXIII. 751.

Nullification, XXIII. 763. With this read Andrew Jackson, XIII. 533, and John C. Calhoun, IV. 683.

Slavery.

Opposition to Slavery, XXIII. 765. William Lloyd Garrison, X. 85. History of Slavery, XXII. (beginning near the bottom of page 138 and continuing to the middle of the second column, page 142). Henry Clay, V. 817; Daniel Webster, XXIV. 471; Stephen A. Douglas, VII. 377.

Entering now upon the period of the CIVIL WAR and the reconstruction which followed it, XXIII. 774–784, we may read, for additional information, the articles Abraham Lincoln, XIV. 658, U. S. Grant, sup. 1442, Jefferson Davis, sup. 996, and Robert E. Lee, XIV. 399.

Read also the article on the Confederate States of America, sup. 884.

Supplementary Chapters.

Before concluding this course of reading, it will be well to notice another very important article, or rather series of articles, relating to the history of our country. Among the articles comprising the American supplements to the *Britannica* there are eighteen pages of matter, sup. 2983–3001, which should be read, and some of it studied thoroughly. The facts there given are of interest and importance to every American citizen. Here are the headings of some of the sections:

The admission of the several States, p. 2985.

Representatives in Congress, p. 2984.

Crime in the United States, p. 2986.

Presidential elections, p. 2987.

Centre of Population, p. 2988.

Recent History of the United States, p. 2993.

II. ANCIENT HISTORY.

In indicating the following course of reading, an attempt will be made to cover all the more important periods of

ancient history, and at the same time not to mark out more than can be mastered within a reasonable length of time. It is possible that the reader will enlarge it at many points by reading entire articles, of which only parts are here indicated; but, whether he does this or not, he should find himself at the end of the course possessed of a good general knowledge of ancient history, of its leading characters, and its more interesting scenes and incidents.

Oriental Countries.

EGYPT.—A long and very scholarly article on this country is contained in the seventh volume of the *Britannica*. Read the following sections with special care:

Description of Egypt, page 702; its ancient inhabitants, page 713; its chronology, page 728; the Egyptian dynasties, page 730; the twelfth dynasty, page 734; the accession of Ptolemy I., page 745.

ASSYRIA AND BABYLONIA.—Read the entire article on these countries, III. 183. Read also the description of Babylon, III. 182, and of Nineveh, XVII. 511; also, the account of Jonah, XIII. 736, and that of Berosus, III. 607.

PHŒNICIA.—Read the greater part of the article under this heading, and especially the following sections: Description of Phœnicia, XVIII. 801, 802; origin of the Phœnicians, page 803; navigation, trades, and colonies, pages 804–807. Read also the articles Tyre, XXIII. 710, and Sidon, XXII. 35.

PERSIA.—In volume XVIII. of the *Britannica*, one hundred pages are devoted to Persia. The history of ancient Persia extends from page 561 to page 616. If your time is limited, begin with the section entitled Medo-Persian Empire, page 561; read the history of Cyrus, page 564, and of his successors, to the accession of Artaxerxes, page 573. The account of the expedition against Greece may be de-

ferred until its proper place is reached in Greek history.

Greece.

GREECE.—With the history of this country it is necessary to spend much more time. Begin by reading the whole of Section I.—"Greek History to the Death of Alexander the Great"—volume XI., pages 89–105. For collateral reading, see the following articles: Troy, XXIII. 577–582; Lycurgus, XV. 95; Sparta, XXII. 369; Greek Games, X. 64. While studying the history of Attica, XI. 95, refer to the article Athens, III. 1, and read with particular care the description given of that city by Pausanias, III. 9. Solon's account of his own work, XI. 97, is supplemented by a much fuller account in the twenty-second volume of the *Britannica*, page 253. Here, too, it will be well to read the biography of Pisistratus, XIX. 130. The events which follow the historic battle of Marathon, IX. 99, bring prominently forward the great rival statesmen, Aristides, II. 504, and Themistocles, XXIII. 250. Then follows the period of Athenian supremacy, XI. 100, and in connection with it the article on Pericles, XVIII. 529, should be read. With the Theban supremacy, read Epaminondas, VIII. 456; and, with the decay of Greek civic life XI. 103, study the excellent article on Demosthenes, VII. 67.

Turn, now, to the article MACEDONIAN EMPIRE, XV. 138, and read down to the account of the departure of Alexander on his great expedition against Persia. From this point, continue the story with the article Alexander the Great, I. 480. The death of Alexander, as you will learn, was the signal for the breaking up of his empire. Ptolemy, one of his generals, established himself in Egypt, VII. 745; Seleucus, another general, founded a new Persian empire, with its capital at Seleucia, on the Tigris, XVIII. 58; and Antipater, who had

been made regent of Macedonia, maintained the integrity of Greece, XV. 144. We need not follow now the history of these fragments of Alexander's great empire—their wars with one another, and their internal dissensions. A new empire was about to arise which should overpower them all.

Roman History.

ROME.—The article under this heading, XX. 731–837, embraces a complete and very interesting survey of the history of the Eternal City from its foundation in legendary times to the year 1870. Read, as a beginning, the first sixteen pages of the article, to the section entitled, "Rome and the Mediterranean States." Numerous collateral references present themselves, but, if your time is limited, they may be omitted, and the reading of the principal article may be continued. The story becomes very interesting now, and you need not be told to read it carefully. The second Punic War brings to our notice HANNIBAL, XI. 441, and the elder SCIPIO, XXI. 466. In connection with the third Punic War we shall read of the younger Scipio, XXI. 468, and of Cato the Censor, V. 239. Other collateral readings will include: Marius, XV. 549; Sulla, XXIII. 632; Cicero, V. 770; Catiline, V. 338; Pompey, XIX. 450; and Julius Cæsar, IV. 633.

These readings ought to give you a very complete knowledge of the history of Rome, in the palmy and heroic days of the Republic, as well as in the period of that Republic's degeneracy.

The story of the Empire begins on page 769, of the twentieth volume; it ends with the downfall of the Western Empire (A. D. 476), as described on page 781. Let us, however, continue our reading with the Eastern Empire, until it, too, is ended with the fall of Constantinople, A. D. 1453. We shall find this part of the story in the article

GREECE, XI. 110–120. On the thread of these two articles the following biographies, each in its proper place, may be strung.

Augustus, III. 79; Tiberius, XXIII. 335; Nero, XVII. 347; Trajan, XXIII. 502; Hadrian, XI. 363; Commodus, VI. 207; Constantine, VI. 298; Justinian, XIII. 792.

For further collateral reading, add the following articles: Goths, X. 846; Vandals, XXIV. 58; Attila, III. 61.

This course of reading embraces in the aggregate about 150 pages of the *Britannica*. By reading an hour or so regularly every evening, one may complete it in a short time; and there is no doubt but that the reader will obtain from it a far more satisfactory view of ancient history than can be gained from any of the so-called "Universal Histories." The reason is obvious. Here the subject is presented as in a painting, with a distinct background, and the foreground appropriately filled with lifelike figures. It is no mere catalogue of events that you have been studying; it is history itself.

Conclusion.

III. MODERN HISTORY.

The Mohammedan Empire.—The first part of the article, MOHAMMEDANISM, XVI. 545, relates the story of Mohammed and the first four caliphs. Read this part carefully. Then proceed to the second part, XVI. 565, which gives an account of Moslem conquest and dominion down to the capture of Baghdad by Jenghis Khan, A. D. 1258. The most important event for us during this latter period is the conquest of Spain, a full account of which may be found in the article SPAIN, XXII. 312–315.

The Arab Conquest.

Continental Europe from A. D. 476 *to* A. D. 1454.—The period of ten centuries which intervened between the fall

of the Western Empire and the capture of Constantinople by the Turks may be briefly studied. The Franks invade Gaul, IX. 528; the Goths and Lombards establish themselves in Italy, XIII. 467; the Visigoths gain control of Spain, XXII. 308; a new empire is established by CHARLEMAGNE, V. 402. This brings us to the year 814. From this point to the close of the period only a few events need be noticed. The rise of the feudal monarchy in France, IX. 536; the Hapsburg dynasty, X. 491, and III. 124; the house of Brandenburg in Germany, XX. 4. Now read the account of the Hundred Years' War between France and England, IX. 545–551. This prepares us for the study of the article on Feudalism, IX. 119, and the various notices of CHIVALRY indicated in the Index volume, page 96.

The Middle Ages.

The chief events of this period are connected with the Crusades, which are the subject of an interesting and important article, VI. 622. In connection with the above-named articles there is room for a good deal of collateral reading. Study the following articles:

Venice, XXIV. 141; Florence, IX. 333; Medici, XV. 783; Naples, VII. 191; Hanseatic League, XI. 449; and a part of the article on commerce, VI. 199–201.

From A. D. 1454 *to the French Revolution.*—Among the important events of this period were the following:

The discovery of America, X. 179–192.

The invention of printing, XXIII. 687.

The Reformation, XX. 319.

The invention of the steam engine, XXII. 473.

Modern Europe.

The study of the history of this period may begin with the RENAISSANCE, XX. 380. In connection with this study, refer to the historical portion of each of the following articles:

Austria, III. 124–131; Prussia, XX. 1–11; Holland, XII. 70–82; France, IX. 552–596.

See also Italy, XIII. 482; Spain, XXII. 339.

The portions of this history which will claim our chief attention are: The career of CHARLES V., X. 413; the struggle of the Netherlands with Spain, XII. 74–77; the Thirty Years' War, III. 125. In connection with these, read: Wallenstein, XXIV. 328; Gustavus Adolphus, XI. 333; Louis XIV., IX. 573–583; Philip II. of Spain, VIII. 743; Catherine de Medici, V. 235; Peter the Great, XVIII. 698; Charles XII. of Sweden, IV. 420; Frederick the Great, IX. 735; and Catherine II. of Russia, V. 233.

From the French Revolution to the Present Time.—The leading article for the study of this period is that on FRANCE from page 596 to page 629, volume IX. Here you may read (1) of the Revolution, page 596; (2) of the Republic, page 604; (3) of the Empire, page 615; (4) of the subsequent history of France to the close of the presidency of M. Grévy. A supplementary article, sup. 1323, brings the history of France down to date. In connection with the above, read the following biographical sketches: Mirabeau, XVI. 492; Marie Antoinette, XV. 540; Robespierre, XX. 601; Danton, VI. 815; Marat, XV. 526.

The XIXth Century.

The history of NAPOLEON fills thirty-seven pages of the *Britannica*, XVII. 162. In connection with this article, read the following: Josephine, XIII. 751; Talleyrand, XXIII. 29; Wellington, XXIV. 493.

These articles alone will give us the best part of the political history of Continental Europe down to the year 1815. The more important events which have since occurred outside of France may then be read:

The liberation of Greece, XI. 125.

The Crimean war, XXI. 102.
The unification of Italy, XIII. 466.
The Austro-Prussian war, X. 502.
The Franco-Prussian war, X. 503–506.

And now you will no longer need the help of the GUIDE. Almost any information that you may desire can be found by turning to the proper heading in the *Britannica* as indicated in the Index volume.

For events that have occurred since 1879, as well as for the biographies of men who were living at that time, it is always well to consult the American supplements. For example, there is no separate article on Bismarck in the main portion of the *Britannica;* but in the supplement, page 478, there is a complete biographical sketch, and in the Index volume (page 57) there are references to still other articles in which he is mentioned.

Here also are to be found articles relating to many other historical events of recent occurrence. See

Home Rule, sup. 1602.
Corea and the war between China and Japan in 1895, sup. 917.

The British Dominions — England. — In the article BRITANNIA, IV. 352, an account is given of the ancient Britons, and of the occupancy of their country by the Romans previous to its settlement by the English. The historical part of the article ENGLAND fills about one hundred pages (VIII. 263–367), which may be read at your odd moments of leisure The history of England since 1874 is succinctly told in sup. 1449.

Early Britain.

From these articles alone you may obtain a good practical knowledge of English history. In connection with them, however, it will be profitable to read the following briefer articles:

William the Conqueror, XXIV. 574.
Richard Cœur de Lion, XX. 539.
Henry VIII., XI. 662.
English Biography. Queen Mary, XV. 592.
Lady Jane Grey, XI. 193.
Queen Elizabeth, VIII. 142.
Sir Francis Drake, VII. 389.
Charles I., V. 404.
Oliver Cromwell, VI. 597.
William III., XXIV. 578.
Queen Anne, II. 62.
Marlborough, XV. 553.
Lord Chatham, V. 540.
Charles James Fox, IX. 494.
William Pitt, XIX. 134.

Read, also, ARMADA, II. 543, and ENGLISH COSTUMES, IV. 465.

Scotland.—See an article on SCOTLAND, XXI. 471–520. Read also for an account of specially important periods in Scottish history, the following biographical sketches:

Scottish History. William Wallace, XXIV. 326.
Robert Bruce, XX. 592.
Mary Queen of Scots, XV. 594.

Ireland.—The historical part of the article IRELAND, XIII. 214–272, is extremely interesting. It includes such topics as the following: Legendary history of Ireland, page 243; Scottish conquest of Ulster, page 246; early Irish church, page 248; Anglo-Norman invasion, page 258; Cromwell's campaign, page 267; James II. in Ireland, page 286; struggle for independence, page 270; Fenianism, page 271.

Irish History.

India.—For a history of the English in India, see article INDIA, XII. 796–812. Read, also, the biogra-

phies of Robert Clive, VI. 8, and Warren Hastings, XI. 512.

British Colonies.

Africa.—For an account of the various possessions and dependencies in Africa, refer to the Index volume, and read what is said in the *Britannica* with reference to each of the several colonies or countries. Study particularly the article on the present condition of Africa, sup. 59–83. Read, also, the special articles on

Natal, XVII. 239.

Cape Colony, V. 44–49.

Rhodesia, sup. 2544; Cecil Rhodes, sup. 2543.

Jameson, L. S., sup. 1721.

Stanley, Henry M., sup. 2777.

Australia.—For the history of the exploration and settlement of this continent, see AUSTRALIA, III, 103–106.

Other Courses.

There still remain in the *Britannica*, hundreds of historical and biographical articles which have not been mentioned in this chapter. But you can find them, if need be, without the help of a guide. Having been conducted thus far along the road, you will now have no difficulty in making your own way. With a little study and care you may even mark out another course of historical reading for yourself; for the *Britannica* contains the materials for very many such courses.

CHAPTER VII.

FIVE COURSES OF READING IN THE HISTORY OF LITERATURE.

COURSE THE FIRST.—AMERICAN LITERATURE.

"O strange New World, that yet wast never young,
Whose youth from thee by gripin' want was wrung,
Brown foundlin' o' the woods, whose baby bed
Was prowled round by the Injun's cracklin' tread,
An' who grew'st strong thru' shifts an' wants an' pains,
Nursed by stern men with empires in their brains!"

LET us begin this study by a review of the history of our own literature, for it is in the institutions and productions of his own country that the pride and hope of every true American should be centered. "The number of writers who have acquired some amount of well-founded reputation in the United States is startling." In the course of study which we shall here offer, we can do little more than refer the student to the *Britannica's* numerous biographical sketches of American writers. The special article on AMERICAN LITERATURE, I. 718–735, written by the late Professor Nichol of Glasgow, is worthy of our careful attention; and the first two chapters of that article should be read by way of introduction to the course which we have before us. The first part of the third chapter (I. 720) will introduce us to colonial literature and the earliest American writers.

Captain John Smith, whose description of Virginia is usually spoken of as the first American book, is the subject of a long and interesting article, XXII. 173. But Smith's book can scarcely be called literature—certainly not in the better sense of the term. The first genuine literay work performed in America was George Sandys's translation of the works of Ovid, made on the banks of the James River, and published in 1626. See the article, George Sandys, XXI. 262 (also Ovid, XVIII. 78). Of other early writers in America, there are a few whose biographies should be studied. Read the lives of the great theologians and controversialists of colonial New England:

Colonial Writers.

Roger Williams, XXIV. 586.
John Cotton, XII. 726.
John Eliot, the Apostle of the Indians, VIII. 136.
Cotton Mather, XV. 631.
Jonathan Edwards, VII. 688.

Then turn to the article on Benjamin Franklin, IX. 711. This, with the first two columns of Chapter III., on page 720 of volume I. will complete our study of the Colonial Period.

Concerning the orators, statesmen, and poets who flourished during the REVOLUTIONARY PERIOD there is much to read; and yet of the writings of that period there remains to us but little that is of permanent literary value. Read what is said on this subject on pages 721 and 722 of the first volume of the *Britannica*. Read the articles on

Statesmen and Poets.

Patrick Henry, XI. 676.
Alexander Hamilton, XI. 412.
Thomas Jefferson, XIII. 613.
John Trumbull, XXIII. 592.
Joel Barlow, III. 377.

Coming now to the literature of the NINETEENTH CENTURY, let us read first of the great historians:

Historians.
- George Bancroft, sup. 334.
- Richard Hildreth, sup. 843.
- William H. Prescott, XIX. 702.
- John Lothrop Motley, XVII. 2.

Francis Parkman, sup. 2296.

Of the orators:

Orators.
- Daniel Webster, XXIV. 471.
- Henry Clay, V. 817.
- John C. Calhoun, IV. 683.
- Edward Everett, VIII. 736.

Of writers of fiction and miscellanies:

Washington Irving, XIII. 372.

Novelists, etc.
- Nathaniel P. Willis, XXIV. 587.
- James Fenimore Cooper, VI. 337.
- Charles Brockden Brown, IV. 383.
- Nathaniel Hawthorne, XI. 536.

William Dean Howells, sup. 1625.

Of essayists and theologians:

Essayists, etc.
- William Ellery Channing, V. 393.
- Theodore Parker, XVIII. 300.
- Ralph Waldo Emerson, sup. 1195.
- Henry D. Thoreau, XXIII. 313.

Oliver Wendell Holmes, sup. 1598.

Of poets:

Henry W. Longfellow, XIV. 860.

Poets.
- Edgar Allan Poe, XIX. 255.
- William Cullen Bryant, sup. 601.
- James Russell Lowell, sup. 1924.
- John G. Whittier, sup. 3146.

Walt. Whitman, sup. 3145.

Read, next, Chapter IV., pages 722–734, Volume I.

The new era in the history of American literature be-

gan at about the time of the Civil War. The products of that period, and the characteristics which distinguished them, are described in an able article by F. L. Pattee, in sup. 158–165. See, also, American Drama, sup. 1076.

If the student wishes to continue this course of reading so as to include a still more minute survey of our recent literature, with a study of the lives and works of some of the later writers, he can do so without further direction from the GUIDE. By consulting the Index volume he will be able in most cases to find any name of real prominence in American literature.

Recent Literature.

A course of reading pursued in the manner here indicated cannot fail to impart a comprehensive knowledge of the history of our own literature. If conducted in connection with the reading of extracts from the writers mentioned, its educative value can scarcely be overrated. The readings may conclude with the "Summary," I. 734–735.

COURSE THE SECOND—ENGLISH LITERATURE.

See the special article on English literature, VIII. 403. This is a long and valuable contribution by Thomas Arnold, and should be read in parts in connection with the following short articles, or parts of articles:

Eleven Periods.

I. ANGLO-SAXON PERIOD, 596–1066.

The Venerable Beda, III. 480.
Caedmon, the first English poet, IV. 629.
King Alfred, I. 506; VIII. 404.
Ælfric, the Grammarian, I. 182.

II. ANGLO-NORMAN PERIOD, 1066–1215.

Romances and legends of King Arthur, V. 322; II. 649; VIII. 309; IX. 639.

Layamon (13th century), XIV. 374.
Geoffrey of Monmouth (12th century), X. 172.

III. THE TRANSITION PERIOD, 1215–1350.

Matthew Paris (13th century), XV. 633.
Duns Scotus, VII. 545.
Roger Bacon (died 1292), III. 218.
Ormin's Rhythmic gospels, VIII. 395.
Robert Manning, XV. 494.

IV. EARLY ENGLISH LITERATURE, 1350–1477.

John Wickliffe, XXIV. 708.
John Gower, XI. 21.
Geoffrey Chaucer, V. 449; VIII. 411.
John Lydgate, XV. 97.
The invention of printing, XI. 336; VIII. 413.
Caxton, the first English printer, V. 279; VIII. 398.

V. THE RENAISSANCE AND THE REFORMATION, 1477–1579.

Sir Thomas More, XVI. 815.
John Skelton, XXII. 119.
Henry Howard, Earl of Surrey, XXII. 694; XXIV. 704.
Sir Thomas Sackville, VII. 372.
Roger Ascham, II. 677.

VI. THE ELIZABETHAN ERA, 1579–1620.

Sir Philip Sidney, XXII. 35; XVIII. 346.
Edmund Spenser, XXII. 392.
William Shakespeare, XXI. 737.
Ben Jonson, XIII. 741.
Sir Francis Bacon, III. 200; VIII. 422.

VII. THE PURITAN PERIOD, 1620–1660.

Jeremy Taylor, XXIII. 93.
Edmund Waller, XXIV. 330.

Abraham Cowley, VI. 532.
Thomas Hobbes, XII. 31.
John Milton, XVI. 324; XIX. 267.

VIII. PERIOD OF THE RESTORATION, 1660–1700.

John Dryden, VII. 488.
Samuel Butler, IV. 588; XXI. 319.
John Bunyan, IV. 526.
John Locke, XIV. 751.

IX. IN THE AGE OF QUEEN ANNE, 1700–1727.

Daniel Defoe, VII. 26.
Joseph Addison, I. 146.
Alexander Pope, XIX. 481.
Dean Swift, XXII. 761; XXI. 320.

X. THE GEORGIAN ERA, 1727–1800.

William Cowper, VI. 533.
Robert Burns, IV. 566.
Richard Brinsley Sheridan, XXI. 797.
Samuel Richardson, XX. 543.
Henry Fielding, IX. 142; XXI. 320.
Laurence Sterne, XXII. 541.
Samuel Johnson, XIII. 719.
Oliver Goldsmith, X. 760.
David Hume, XII. 346.
Edward Gibbon, X. 572.
William Robertson, XX. 599.
Bishop Butler, IV. 582; I. 792.

XI. THE NINETEENTH CENTURY.

Sir Walter Scott, XXI. 544.
Lord Byron, IV. 604; XXI. 320.
Percy Bysshe Shelley, XXI. 789.

Robert Southey, XXII. 289.
William Wordsworth, XXIV. 668; XIX. 271.
Samuel Taylor Coleridge, VI. 135.
John Keats, XIV. 22.
Alfred Tennyson, sup. 2877.
Robert Browning, sup. 592.
Charles Dickens, VII. 173.
William M. Thackeray, XXIII. 214; XXI. 320.
George Eliot (Mrs. Mary Ann Cross), sup. 951.
Sir Edwin Arnold, sup. 243.
Matthew Arnold, sup. 244.
Thomas Carlyle, sup. 701.
John Richard Green, sup. 1460.
John Ruskin, sup. 2589.
Poet Laureate, sup. 1841.
Read now the article on CANADIAN LITERATURE, sup. 675–677

COURSE THE THIRD—ANCIENT LITERATURE.

1. *Greek Literature.*—The article on Greek literature, XI. 136, is a comprehensive sketch of the literary development of Greece, showing how its successive periods were related to each other, and marking the dominant characteristics of each. It should be read in parts, in connection with the separate articles relating to the lives and particular works of Greek writers. The study of this literature naturally begins with the Homeric hymns and with the two great epics, the *Iliad* and the *Odyssey*. See the article Homer, XII. 108.

Greek Writers.

After this read the following articles on three great poets of ancient Greece:

Hesiod, XI. 777.
Simonides, XXII. 83.
Pindar, XIX. 98.

This brings us to the GREEK DRAMA. Read the first two paragraphs on the Attic Literature, XI. 140; then turn to the article DRAMA, VII. 403, and read the six pages devoted to Greek drama. After this take up each of the great dramatists separately, the tragedians first:

The Drama.

Æschylus, I. 208.

Sophocles, XXII. 271.

Euripides, VIII. 673.

Then re-read what is said of GREEK COMEDY, VII. 407, and study the article on the great comic dramatist, Aristophanes, II. 507.

PROSE WRITERS will next claim our attention, and especially the great historians, Herodotus, XI. 756; Xenophon, XXIV. 720, and Thucydides, XXIII. 322. After these make a short study of the Greek orators, XI. 142, and especially of Demosthenes, VII. 67, and of Isocrates, XIII. 388.

Historians and Orators.

The Greek philosophers will then come in for brief mention. Read the biographical portion of each of the following articles:

Philosophers.

Socrates, XXII. 231.

Plato, XIX. 194.

Aristotle, II. 510.

Attention may now be given to the chapter entitled, THE LITERATURE OF THE DECADENCE, in XI. 142, wherein is given a brief survey of the literary history of the Alexandrian and Græco-Roman periods of intellectual activity. Here a number of interesting names present themselves. In the department of pastoral poetry, we shall read of Theocritus, XXII. 252, and of his disciples and imitators, Bion, III. 696, and Moschus, XVI. 855. In the field of criticism we shall learn of Aristarchus, II. 504, whose studies,

Later Writers.

with those of his disciples, gradually formed the basis for the science of grammar. In mathematics we find the noted name of Euclid, VIII. 655. In prose fiction we have Lucian, XV. 42, the inventor of the art of the story-writer. In history we have Josephus, the historian of the Jewish nation, XIII. 751. In biography, Plutarch stands forth preëminent, XIX. 232. In geography appears the noted name of Strabo. In rhetoric we have Cassius Longinus, XIV. 864, the reputed author of the still famous essay on Sublimity. In philosophy are the great names of Epictetus, VIII. 471, and Marcus Aurelius, III. 86.

But it is time to bring these readings in Greek literature to a close. It would of course be easy to extend them almost indefinitely; and the student who wishes to do so may, by referring to the numerous articles devoted to the lives of famous Greek writers, continue it to almost any desired length.

2. *Roman Literature.*—In the department of Roman literature we shall take as the basis for our studies the very comprehensive and scholarly article on that subject in XX. 715–727. This article, which gives a general survey of the progress of literature during the different periods of Roman history, should be read in sections, with constant reference to the separate articles devoted to the lives of the most famous Latin writers In connection with the chapter on the first period (from 240 B. C. to about 80 B. C.), read the account of the ROMAN DRAMA, VII. 409, 412. Then study the history of the early Roman dramatists:

First Period.

Nævius, XVII. 161. Plautus, XIX. 215.
Ennius, VIII. 447. Terence, XXIII. 186.

In connection with the chapter on the second period (80 B. C. to 42 B. C.), read the following special articles:

Second Period.

Cicero, V. 77. Cæsar, IV. 633.
Sallust, XXI. 219. Lucretius, XV. 50.

Third Period.

With the third period (42 B. C. to 17 A. D.) we enter upon the study of the AUGUSTAN AGE OF ROMAN LITERATURE, III. 82–84. Here a noble list of names is presented, demanding a special study of the following biographical articles:

Virgil, XXIV. 248. Horace, XII. 159.
Ovid, XVIII. 78. Livy, XIV. 725.

Fourth Period.

During the fourth period, extending for more than a century (17 A. D. to 130 A. D.), Roman literature continues to flow in the old channels, but there is a manifest deterioration in almost every department of literary effort. And yet among the dramatists we have Persius XVIII. 661, and Juvenal XIII. 804; among historians, Tacitus, XXIII. 19; among philosophers, Seneca, XXI. 658; among rhetoricians, Quintilian, XX. 187; and among poets, Martial, XV. 577, and Statius, XXII. 466. "The last writer who combines genius with something of national spirit, is the poet Claudian (V. 815), who wrote his epics under the immediate inspiring influence of a great national crisis and a national hero." After him there is perhaps only one Latin writer whose life and works are deserving of study in this connection. That writer is Boetius (III. 855), who lived in the fifth century of our era, and who is described by Gibbon as "the last of the Romans whom Cato or Tully could have acknowledged for their countryman."

COURSE THE FOURTH—FOURTEEN GREAT LITERATURES.

1. *Hebrew.*—XI. 597. The Bible, III. 634–641; Early Israelitish literature, XIII. 408; the Talmud, XXIII. 35; the Midrash, XVI. 285; the Mishnah, XVI. 502.

2. *Sanskrit.*—XXI. 273–286.

3. *Persian.*—XVIII. 655.

4. *Greek.*—XI. 136. Homer, XII. 108; Xenophon, XXIV. 720; Demosthenes, VII. 67.

5. *Roman.*—XX. 715–727. Cæsar, IV. 633; Cicero, V. 770; Augustan Age, III. 82; Virgil, XXIV. 248; Ovid, XVIII. 78; Livy, XIV. 725.

6. *Chinese.*—V. 653.

7. *French.*—IX. 637. Rabelais, XX. 193; Montaigne, XIV. 767; Corneille, VI. 417; Pascal, XVIII. 333; Molière, XVI. 624; La Fontaine, XIV. 203; Racine, XX. 203; Boileau, III. 863; Bossuet, IV. 70; Voltaire, XXIV. 285; Rousseau, XXI. 23; Victor Hugo, IX. 676, sup. 1629; Cousin, V. 521; Guizot, XI. 268; Dumas, VII. 521; George Sand, VII. 507; Émile Zola, sup. 3231; the French Academy, sup. 31.

8. *German.*—X. 522. Luther, XV. 71; Arndt, II. 622; Wieland, XXIV. 558; Lessing, XIV. 478; Herder, XI. 727; Goethe, X. 721; Schiller, XXI. 395; Novalis, XI. 472; Hegel, XI. 612; Heine, XI. 625; Paul Heyse, X. 545; Spielhagen, X. 545; Fritz Reuter, XX. 494; Auerbach, 169 sup.; Freytag X. 545, sup. 1343; Ebers, sup. 1110.

9. *Italian.*—XIII. 498. Dante, VI. 809; Petrarch, XVIII. 706; Boccaccio, III. 842; Ariosto, II. 502; Alfieri, I. 502; Carducci, sup. 697.

10. *Spanish.*—XXII. 252. Lope de Vega, XXIV. 121; Cervantes, V. 347; Calderon, IV. 659.

11. *Russian.*—XXI. 102; Turgenieff, XXIII. 488; Tolstoi, sup. 2923; Gogol, X. 738; Marie Bashkirtseff, sup. 373.

12.—*Swedish.*—XXII. 753. Tegner, XXIII. 110; Frederika Bremer, IV. 256; Runeberg, XXI. 60; Topelius, XXII. 758; Rydberg, sup. 2595.

13. *Norwegian.*—XVII. 589. Björnstjerne Björnson,

sup. 481. Henrik Ibsen, sup. 1645; Asbjörnsen, sup. 260.

14. *Danish.*—VII. 89. Oehlenschläger, XVII. 730; Hans Christian Andersen, sup. 178.

COURSE THE FIFTH—GENERAL VIEW OF THE SUBJECT (FOR ADVANCED STUDENTS).

Prose Literature.—Let us begin our general study of prose literature by reading the article on History, XII. 19. Numerous collateral and additional references relating to the same subject will suggest themselves, and should be traced out and studied. Among these are the following: Influence of history upon the development of culture, II. 121; relation of history to evolution, VIII. 759; the philosophy of history, XVIII. 796; relation of history to archæology, II. 334, etc. Following the reading of these, we may make a brief study of the distinctive features of the works of certain great historians. For example, read what is said of Herodotus, XI. 758; of Thucydides, XXIII. 325; of Livy, XIV. 726; of Sallust, XXI. 219; of Tacitus, XXIII. 20; of Villehardouin, XXIV. 229; of Robertson, XX. 599; of Hallam, XI. 393; of Macaulay, XV. 128.

History.

Fiction.—Read the special article on Romance, XX. 632; also the article by Andrew Lang, entitled, TALES, XXIII. 27. Let this be followed by a study of the romance literature of different countries. Observe what is said of French romance, IX. 638; of Germany, X. 527; of Spanish, XXII. 354; of Arabian, XXIII. 5; of Persian, XVIII. 657. As to romanticism in English literature, see XX. 857. The influence of romanticism upon French literature is described in IX. 675; and upon German literature, in X. 541.

Fiction.

The Drama.—Read the very comprehensive article on the drama, VII. 391. Study about the drama in the time of Shakespeare, XXI. 759; about the Greek drama, XI. 140; about the French drama, IX. 644; about the Spanish drama, XXII. 356; about the miracle-plays, V. 324. Read the special article on the theatre, XXIII. 222.

Drama.

Poetry.—The scholarly article on Poetry, XIX. 256–273, is worthy of careful study. It would be well to read it by paragraphs, making reference in the meanwhile to additional articles on the lives and works of the great poets therein mentioned. Read Wordsworth's theory of poetry, XXIV. 670. See what is said of poetry as a fine art, IX. 207.

Poetry.

Satire.—Read the article on satire, XXI. 317. Study the lives and works of the great modern satirists: Rabelais, XX. 193; Voltaire, XXIV. 285; Dean Swift, XXII. 761; Thackeray, XXIII. 214, etc.

Satire

SUPPLEMENTARY COURSE.—BOOKS AND LIBRARIES.

This course may consist chiefly of a study of the two important articles on books, XVIII. 144, and libraries, XIV. 509.

The Advocates' Library, sup. 53.

Astor Library, sup. 272.

Boston Public Library, sup. 527.

Libraries in Chicago, sup. 783.

See "Some Bookish Subjects" in the chapter entitled *The Bookman*, in this GUIDE.

For libraries in the United States, see XIV. 534, and sup. 1873. An interesting account of the Library of Congress is given in the article beginning on page 3139, supplements.

CHAPTER VIII.

READINGS IN PHILOLOGY AND THE HISTORY OF LANGUAGE.

"They have been at a great feast of languages."—*Love's Labour Lost.*

PHILOLOGY is that branch of knowledge which deals with human speech, and with all that speech discloses as to the nature and history of man. In the following courses of reading it is proposed to give a general survey of the principal languages of the world, their history and the distinguishing characteristics of each. These courses may be considered as either prefatory or supplementary to the courses already indicated for readings in the history of literature. A fairly good knowledge of general history, such as may be acquired from the readings designated in Chapter VI. of this volume, will add very much to your ability to appreciate and fully understand the courses which follow.

COURSE NO. I.

Begin with the article PHILOLOGY, XVIII. 765, and read carefully that part which relates to the science of language in general, pp. 765–778. This will give a general view of the subject, and prepare you for the more specific study of particular languages. The following articles, or parts of articles, may then be read:

Philology.

History of language (article ANTHROPOLOGY), II. 117.

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Theories of evolution with respect to language, VIII. 769.

Language and ethnology, VIII. 621.

Language and thought, XX. 751.

Language and mythology, XVII. 137.

ARYAN LANGUAGES, II. 697 and XVIII. 778 a. To this family of languages belong ten groups or sub-families, as follows:

Aryan Languages.

1. *Sanskrit.*—XXI. 269; XI. 841.
2. *Iranian.*—XVIII. 134.
3. *Armenian.*—II. 549.
4. *Greek.*—XI. 126. See also Greek literature; and learn about the Romaic dialects which originated in the Greek, XI. 135.
5. *Albanian.*—XVIII. 784.
6. *Italic.*—This group includes the Latin language, for a full history of which see XIV. 327. From the Latin have sprung the Romance languages, which are the subject of a valuable article in XX. 661. The great modern Romance languages are each treated in a separate article, as follows:

(1) Italian, XIII. 491; XIV. 340.
(2) Spanish, XXII. 346.
(3) Portuguese, XIX. 555.
(4) Provençal, XIX. 867.
(5) French, IX. 629.
(6) Ladino, XIII. 492.
(7) Roumanian, XXIV. 269.

7. *Celtic.*—This group of languages is treated very briefly in XVIII. 785, and more fully in V. 297.

(1) The Gaelic language, which is a branch of the Celtic, is the subject of a separate article in X. 6. Other branches are treated as follows:

(2) Irish, V. 298.

(3) Armoric, V. 324.
(4) Cornish (dialect), V. 298.
(5) Welsh, V. 298, 314.

8. *Germanic or Teutonic.*—This great sub-family comprises two groups, known as the Eastern Germanic and Western Germanic languages. In the former group belong the Gothic language, X. 852, and the Scandinavian branch, XXI. 366. Of the Scandinavian languages there are two subdivisions: (1) the Eastern Scandinavian, which comprises,

Swedish, XXI. 370.
Danish, VII. 89, and XXI. 373.

and (2) the Western Scandinavian, which comprises,

Norwegian, XXI. 369.
Icelandic, XII. 627.

The Western Germanic languages are each treated in a separate article:

(1) English, VIII. 390.
(2) Frisian, IX. 788.
(3) German, X. 514.
(4) Dutch, XII. 84.

9. *Baltic.*—This group embraces three unimportant groups, the first of which, Prussian, is now extinct (see XVIII. 785). The other two are the Lithuanian, XXII. 148, and the Lettish, briefly referred to in VII. 188, and XVIII. 785.

10. *Slavonic.*—XXII. 147. Of this group there are two divisions, the Southern and the Western. The former includes the following languages:

(1) Russian, XXI. 109.
(2) Ruthenian, XIX. 309.
(3) Bulgarian, XXII. 149.
(4) Servian, XVIII. 544; XXII. 150.
(5) Slovenish, XXII. 150.

The latter or Western division includes,

(1) Bohemian, XXII. 151.

(2) Polish, XVIII. 785; XXII. 150.

The GUIDE has presented above a brief outline for the study of the Aryan families of languages. The student who follows this course of reading carefully will have acquired no small knowledge of the science of philology, and he will be prepared, by way of review, to study the second part of the article on that subject, XVIII. 781–790.

COURSE NO. II.

A second and shorter course of study in philology might include the Semitic family of languages. To this family belong:

Semitic Languages.

(1) The Hebrew language, XI. 594.

(2) The Phœnician, XXI. 641.

(3) The Assyrian, III. 192.

(4) The Syriac, II. 307.

(5) The Arabic, X. 595.

(6) The Abyssinian, XVI. 654.

By way of supplementing this course, a short time may be spent in tracing the history and peculiarities of the third great family of languages, the Hamitic (see XVIII. 778). Here we have:

(1) The Egyptian language, VII. 721.

(2) The Lybian languages, XVIII. 778.

(3) The Ethiopic languages, I. 263.

A great many other languages and dialects receive notice in the *Britannica*. Not only students of philology, but many curious readers will be pleased to learn something about the language of the Gipsies, X. 613; that of the Papuans, XVIII. 231; that of the Hottentots, II. 312; or that of the Kurds, XIV. 157. But we need enumerate no further.

Miscellaneous Studies.

We have conducted the student to a point whence he will now be able to proceed in his researches without the help of a guide.

Here are a few subjects of general interest, which it is well to know about :

Of General Interest.

Grammar, XI. 37.
Dictionaries, VII. 179.
Americanisms, sup. 154.
Volapük, sup. 3060.

See now the references in the chapter on *The History of Literature* in this GUIDE; also those in the chapter entitled *The Writer.*

CHAPTER IX.

READINGS IN ASTRONOMY.

"And let my lamp at midnight hour
Be seen in some high lonely tower,
Where I may oft outwatch the Bear
With thrice great Hermes ; or unsphere
The Spirit of Plato, to unfold
What world or what vast regions hold
The immortal mind."

—*John Milton.*

THERE are two classes of persons who will be helped by the courses of scientific reading proposed in this chapter, and in those which follow: (1). The young man or young woman who is attempting to pursue some method of self-instruction at home, and is not yet prepared to grapple with the most difficult problems of science. (2). The student who is already well started on the way, and is anxious to extend and supplement the information which he has acquired from teachers and text-books, until he shall have gotten down to the very bottom of the subjects which he is studying. The first class will, as a general rule, be profited most by the shorter and more popular articles in the *Britannica;* the second will often find in the special and more technical articles just that kind of thoroughness and comprehensiveness which scholars admire and desire, and from which they alone are able to derive the

Two Classes of Students.

greatest benefit. It is here that the superiority of the *Britannica* over every other work of reference is most apparent—it has articles adapted to the needs and comprehension of every class of readers.

The following readings in astronomy are intended for students who have attained to some proficiency in the science; and yet an effort has been made to meet the wants of the self-taught home student as well as those of the specialist and the scholar.

The home student should read the historical portion of the article on ASTRONOMY, beginning on page 744 of volume II., and ending on page 763. He will find this chapter quite comprehensive, including nearly ten pages of the *Britannica*, and giving an account of the progress of astronomical science from the earliest ages down to the present time. The college student will find the entire article on astronomy (sixty pages in all), II. 744, to be more complete and satisfactory than most school text-books on the subject. The fact that it was written by Prof. R. A. Proctor, the most famous of our later astronomers, is sufficient guarantee of its accuracy. The supplementary article, beginning on page 273 of the supplement, contains an account of all the important discoveries that have been made within the past twenty years.

History of Astronomy.

Still pursuing the study of the history of this subject, read the entertaining article on ASTROLOGY, II. 738, and see what is said of astronomy in Arabia, II. 264. After that, read the biographies of the most famous astronomers, ancient and modern:

Astronomers.

Thales, XXIII. 217.
Aristarchus, II. 504.
Hipparchus, XI. 851.
Ptolemy, XX. 87.

Copernicus, VI. 346.
Galileo, X. 30.
Tycho Brahe, IV. 200.
The Herschels, XI. 765, 768.
John Kepler, XIV. 45.
Laplace, XIV. 301.
Richard A. Proctor, sup. 2453.
Camille Flammarion, sup. 1286.
Samuel P. Langley, sup. 1831.
Simon Newcomb, sup. 2169.

The Solar System.

You are now prepared to enter upon the study of descriptive Astronomy. Begin with the SOLAR SYSTEM, and read what Professor Proctor says of the sun in II. 768; then turn to J. Norman Lockyer's scholarly article on the same subject, XXII. 645. The nebular theory of the origin of the sun and planets will next claim your attention; and of this you will find, in XVII. 310, a full exposition and discussion by Dr. R. S. Ball, the distinguished Irish astronomer. The latest discoveries regarding the distance of the sun are described in sup. 275.

Sun Worship.

And now, before proceeding farther, it will be interesting to notice some curious facts concerning the manner in which people of all ages and different nationalities have regarded the sun. Among other things, we shall learn how it was worshipped by the Sabæans, XXIV. 741; by the Phœnicians, XVIII. 802; by the Greeks, II. 185; and by the ancient Peruvians, I. 697.

Read what is said of solar myths, XVII. 157, and XV. 777 a; also the myth of Phæthon, XVIII. 727; that of Adonis, I. 153; and that of Apollo, II. 185.

Festivals to the sun were held at Heliopolis, see XIX. 91, and also in Japan, XIX. 92; and one of the most fa-

mous temples in the world was that of the sun at Baalbec, see III. 177.

Resuming the subject of descriptive astronomy, and the study of the solar system, read next of the PLANETS in their order:

The Planets.

Mercury, II. 777; Venus, II. 782; XIV. 582, XVIII. 246, and II. 754 and 796; the place of the Earth in the solar system, II. 766, and X. 214; Mars, XIV. 46, and II. 776, 796; the Asteroids, II. 736, 806, and sup. 271; Jupiter, XVI. 250 and II. 782, 808; Uranus, II. 758, XI. 767, and II. 782; Neptune, XIV. 487, and II. 782, 813. Olbers's theory of the origin of the asteroids is given in a brief biographical article on that great German astronomer, XVII. 752; and the most recent facts concerning those interesting bodies are stated in sup. 271.

The Moon.

The article on the MOON, XVI. 798, next claims attention. The moon is also described in II. 774, 782. For its motion, see XI. 74; for its phases, II. 797; for its influence on the tides, XXIII. 353–356, 365, 368; for its influence on atmospheric pressure, XVI. 124. The legends and myths of the moon are duly noticed in XI. 680, and XVII. 157.

Eclipses.

Many interesting things are told about ECLIPSES. For the nature and causes of eclipses, see II. 788 and 802; turn also to XIV. 581, and XXII. 650. Some historical facts with relation to the observation of these phenomena are interesting. The Chinese have very ancient records of such observations, see II. 745. The Assyrians also kept similar records, III. 191.

Read what is said about COMETS, II. 813. The article on this subject, VI. 182, belongs to mathematical astron-

omy. Notice Kepler's theories, XIV. 47; Leverrier's, XIV. 486; and Olbers's, XVII. 752. Recent observations on comets are described by Professor Simon Newcomb in sup. 275. For Biela's comet, see VI. 192, and XVI. 111. An account of the appearance of twin comets may be found in XVI. 111.

Comets.

In the article on METEORS, XVI. 106, there is much interesting information. Meteorites, or "falling stars," are noticed in XVI. 112, with the theories regarding their origin, etc. See also AEROLITE, I. 184.

Passing now beyond the solar system, read first that portion of the article on astronomy which refers particularly to the fixed stars, II. 744, 823. For the classification of these stars, with reference to magnitude, turn to XVIII. 840. An interesting notice of new and variable stars is given in XXII. 651. For the measurements of the stars, see XVI. 250; and for their spectroscopic analysis, see X. 215, and XXII. 651.

The Fixed Stars.

Among other subjects which are of interest to students of astronomy, we may mention the following:

The Zodiac, XXII. 791.

The Zodiacal Light, XXIV. 796.

The Galaxy (Milky Way), II. 818.

Corona, VI. 428.

Celestial Photometry, XVIII. 840.

If you would acquire a knowledge of astronomical instruments, read the valuable articles on the telescope, XXIII. 135, and sup. 2871; also that on the transit circle, XIII. 515; the notice of the micrometer, XVI. 242; of the sextant, XXI. 724; of the astrolabe, X. 181. There are two articles on OBSERVATORIES which must not be omitted, XVII. 708–717, and sup. 2236. See the description of

Astronomical Instruments.

Pond's astronomical instruments, XIX. 452, and of Roemer's, XX. 620; also of the Orrery, sup. 2261.

Read of the famous American telescope-maker, Alvan Clark, sup. 816.

In connection with the study of Astronomy, we very naturally think of almanacs and calendars. The *Britannica* gives a good deal of information concerning both of these. The articles on the ALMANAC, I. 590, and American Almanacs, sup. 137, are especially interesting. So, too, is that on the CALENDAR, IV. 664. The different calendars that have been, or are still in use, are each fully described:

Almanacs.

The Egyptian calendar, VII. 728.

The Hebrew calendar, IV. 677.

The Mohammedan calendar, IV. 679.

The Burmese calendar, IV. 555.

The Siamese calendar, XXI. 853.

The Gregorian calendar, IV. 671.

The famous Mexican calendar-stone, I. 695.

The peculiar terms used in almanacs and calendars are also explained, as:

Chronological eras or epochs, IV. 681; V. 711.

Epact, IV. 672.

Dominical letter, IV. 669, etc.

Time.

The various methods of measuring time are described in XXIII. 392.

Difference between mean time and sidereal time, VI. 14.

Equation of time in astronomy, II. 772.

Timepieces, VI. 13; XXIV. 394.

Sun-dials, VII. 153.

Clocks, VI. 13, and sup. 836; Watches, XXIV. 394.

Standard time, XII. 854.

CHAPTER X.

A GENERAL COURSE OF READING IN BIOLOGY.

"Full nature swarms with life."
Thomson, The Seasons.

BIOLOGY in its widest sense is the science of life and living things. It therefore includes Zoölogy and Botany, to which separate chapters are devoted in this GUIDE. The following general course of reading, although far from exhaustive, includes several chapters on subjects relating to the foundation principles of the science. It is distinctively a course for advanced students.

BIOLOGY III. 679.

Protoplasm, XIX. 828, 12, 21, 43.

MORPHOLOGY, XVI. 837.

General Topics.

Histology, XII. 4; III. 681; XVI. 840.

Differentiation, XVI. 79.

Taxonomy, II. 49; III. 683.

Classification, Botanical, XVI. 845, sup. 821–823; zoological, II. 49.

DISTRIBUTION, III. 684; of animals, VII. 267; of plants, VII. 286.

Geological distribution of animals, VII. 281.

Continuity of life, III. 684.

PHYSIOLOGY, III. 684.

Animal physiology, XIX. 10.

Human physiology, XVII. 667.

Vegetable physiology, XIX. 43.

Reproduction, XX. 407.

Gemmation, XXIII. 617.
Fission, III. 686.
Agamogenesis, XIII. 146.
Hereditary transmission, III. 687.
Heredity, I. 87.
Variation and Selection, XXIV. 76.
Individuality, III. 688.
ÆTIOLOGY, III. 688.

Evolution.

Abiogenesis, I. 49.
Biogenesis, II. 689.
Embryology, sup. 1186.
Origin of Species, Darwin on, XXIV. 77, 81; Lamarck on, XIV. 232.
Evolution, VIII. 744.
Neo-Darwinism, sup. 2160.
Phylogeny, II. 49; III. 690.
See, also Haeckel, XX. 422; Darwin, sup. 989; Lamarck, XIV. 231; Huxley, sup. 1639.

THE VEGETABLE KINGDOM. See *Readings in Botany*, in this GUIDE.

Vegetable Kingdom.

Limits and Classification, III. 690.
Thallophyta, XX. 430; XXIV. 125.
Cormophyta, III. 694.

THE ANIMAL KINGDOM. See *Readings in Zoölogy* in this GUIDE.

Animal Kingdom.

Acclimatization, I. 84.
Breeds and Breeding, IV. 244.
Hybridism, XII. 422.
Instinct, XIII. 157.
Animal Mechanics, XV. 772.
Longevity of Animals, XIV. 857.

CHAPTER XI.

READINGS IN ZOÖLOGY.

"I used to believe a great deal more in opportunities and less in application than I do now. Time and health are needed, but with these there are always opportunities. Rich people have a fancy for spending money very uselessly on their culture, because it seems to them more valuable when it has been costly; but the truth is, that by the blessing of good and cheap literature, intellectual light has become almost as accessible as daylight."—*Philip Gilbert Hamerton.*

THE amount and variety of information which the *Britannica* offers on all subjects connected with the natural sciences is truly wonderful. The articles on Zoölogy, or animal life, are very numerous—some of them brief, descriptive paragraphs, instructive and interesting to every reader, others exhaustive treatises designed for the study of specialists. The vast range of such subjects can perhaps best be illustrated by reference to the following schemes for courses of reading in this science. The first two are of a popular character, and are believed to be not too difficult for the home student or amateur zoölogist; the third is more purely scientific, and will be appreciated only by those who have already made considerable progress in the study, and are able to understand its technical difficulties.

Three Courses.

I. HISTORICAL COURSE.

In Volume XXIV., beginning on page 799 and extending to page 803, the history of the science of zoölogy is

treated in a manner which appeals to the interest of every person who cares to acquaint himself with the progress of scientific ideas. After reading this, the student will naturally turn to the biographical sketches of the great men who have contributed most to our knowledge of this subject. The following articles will be especially interesting and instructive:

Progress of the Science.

Biographies.

Aristotle, the most famous of the ancient writers on this subject, II. 510.

Edward Wotton, the first English zoölogist (1492–1555), XXIV. 803.

William Harvey, the discoverer of the circulation of the blood (1578–1658), XI. 502.

Conrad Gesner, the eminent Swiss naturalist of the XVIth century, X. 554.

John Ray, "the father of modern zoölogy" (1628–1705), XX. 300.

Carl Linnæus, "the Adam of zoölogical science," XIV. 671.

Comte de Buffon, the first great popularizer of natural history, IV. 444.

Baron Cuvier, the eminent French naturalist, VI. 740.

Charles Darwin, the great leader of evolutionary biology, sup. 989.

Ernst Haeckel, the famous German disciple of the doctrine of evolution, XX. 422.

Alfred Russel Wallace, author of "The Geographical Distribution of Animals," sup. 3074.

Albrecht von Haller, the Swiss physiologist, XI. 396.

Johannes Müller, the German anatomist, XVII. 17.

Jean Baptiste Lamarck, originator of the theory of evolution, XIV. 231.

Louis Agassiz, the great Swiss-American scientist, I. 274.

Sir John Lubbock, sup. 1926.

Thomas Henry Huxley, the English naturalist, sup. 1639.

Ernst von Baer, founder of the science of embryology, XXIV. 807.

Sir Richard Owen, the foremost of the disciples of Cuvier, sup. 2270.

John Vaughan Thompson, the great authority on marine invertebrata, XXIV. 808.

Theodore Schwann, inventor of the cell theory, XXI, 460.

John James Audubon, the greatest of ornithologists, III. 70.

Alexander Wilson, the Scottish-American ornithologist, XXIV. 590.

Spencer F. Baird, secretary of the Smithsonian Institution, sup. 321.

James Cossar Ewart, founder of marine laboratories, sup. 1226.

G. Brown Goode, director of the National Museum, sup. 1423.

Joseph Leidy, American biologist, sup. 1860.

Lewis Le Conte, American naturalist, sup. 1852.

II. POPULAR READINGS ABOUT ANIMALS.

Mammalia.

As an introduction to these readings it will be interesting to notice the historical paragraphs in the article on ZOÖLOGY, XXIV. 799–803. Read also the first section of the article on MAMMALIA, XV. 347, and the last section of the same article, XV. 444.

Many things in the article on Anthropology, II. 107–123, are both curious and instructive; but for the present the reader's attention is directed only to the section on the

Origin of Man, page 110, and that on the Races of Mankind, page 111.

The article on the APE, II. 148–169, by Professor St. George Mivart, is a complete popular and scientific description of the various families and groups of monkeys. The general reader will be interested in the first section, page 148–155, and also in the concluding sections relating to the geopraphical distribution, etc., of apes.

The ELEPHANT is the subject of an important article, VIII. 122. His prehistoric relatives or progenitors are also appropriately described: the Mammoth, XV. 447; the Mastodon, XV. 622; and the Megatherium, XV. 829.

Perhaps the most interesting of all domestic animals is the CAMEL. See the general article, IV. 735, and also the section on the camel in Arabia, II. 242.

Interesting articles—historical and descriptive, and illustrated—are those on the Dog, VII. 324; and the Cat, V. 202.

Carnivorous animals are represented by the Tiger, XXIII. 385; the Lion, XIV. 679; and the Hyena, XII. 420.

Some curious animals are: the Beaver, III. 475; the Chameleon, V. 381; the Chamois, V. 384; the Sloth, XXII. 161; the Ichneumon, XII. 629.

Birds.

Of the long and very comprehensive article on BIRDS, III. 699, the general reader will select the following chapters as the most interesting: Fossil birds, III. 728; migration of birds, III. 765; birds' eggs, III. 772. The different classes of birds are variously represented and described in a large number of separate articles. For the present it is unnecessary to call attention to any of these articles further than to say that no popular course of reading should omit the Ostrich, XVIII. 62; the Rhea, XX. 505; the Eagle, VII. 589; the Raven, XX. 295; the Hummingbird, XII. 357; and the Albatross, I. 449. The Dodo, that won-

derful bird which has but lately become extinct, is the subject of an interesting sketch, VII. 321.

A general study of fishes, such as is contemplated in this course, should include a glance at the special article, XII. 630, and also a portion of the chapter on fish-culture, XIX. 126. The article on ANGLING, II. 32, will be read and enjoyed by every fisherman. Among the multitude of similar articles, the following on food fishes should not be omitted: Salmon, sup. 2612; Mackerel, XV. 159; Herring, XI. 764; Cod, VI. 103; Sardine, XXI. 307. Fossil fishes are noticed in I. 275, and poisonous fishes in XV. 782. See, also,

Fishes.

Seth Green, the famous fish culturist, sup. 1461.

David Starr Jordan, the American ichthyologist, sup. 1755.

Aquarial building, sup. 3201.

As to reptiles, read the following: Distribution of reptiles in time, XX. 465; Rattlesnake, XX. 293; Cobra, VI. 905; Asp, II. 714; Crocodile, VI. 592; Lizard, XIV. 732.

Reptiles.

Concerning CRUSTACEA, there is a valuable article in VI. 632; but our popular course will include only the chapters relating to the crab, VI. 538, and the lobster, VI. 657.

Ocean life is noticed in an interesting way in VII. 276–281. The articles on the Whale, XXIV. 523; the Walrus, XXIV. 337; the Dolphin, VII. 346; the Seal, XXI. 580, and the Oyster, sup. 2273–2274, are particularly interesting.

Ocean Life.

The above lists include only a very small portion of the articles on animals. These are sufficient, however, to indicate the great variety of interesting and practical information on zoölogical subjects contained in the pages of the *Britannica*.

This course of reading might be extended indefinitely until it should embrace many hundreds of subjects, and require half a lifetime for its completion. The purpose of the GUIDE, however, has been not to present an exhaustive course, but only to indicate that which may be completed easily by the amateur student within a comparatively brief period of time. A still briefer and much easier course is indicated in Chapter IV. of this GUIDE.

III. SUPPLEMENTARY COURSE FOR SPECIAL STUDENTS.

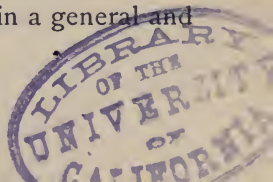
The principal articles on zoölogical subjects, written by specialists and embodying all the lastest discoveries, are particularly valuable to advanced students. They are remarkable alike for their comprehensiveness and their accuracy. Taken together, they would form a complete library of zoölogy in themselves.

After reading the history of the science as it is related in XXIV. 799–803, together with the biographical sketches indicated in Course I. above, the student will be prepared to make some study of the various forms of classification that have been proposed by great naturalists. Most of these may be found in the special article on Zoölogy, already alluded to:

Classification.

Aristotle's, XXIV. 804.
The Linnæan, XXIV. 805.
Lamarck's, XXIV. 806.
Cuvier's, XXIV. 807.
Owen's, XXIV. 808.
Huxley's, XXIV. 809.

A valuable scientific article on classification, written by Mr. Huxley himself, may be found in II. 49. Keeping Mr. Huxley's classification in mind, the student who cares to go so deeply into the subject may obtain a general and


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complete view of the science of zoölogy by studying the following articles in the order here given:

I. *Protozoa*, XIX. 830—a valuable article, very finely illustrated.

II. *Infusoria*, XXII. 106.

III. *Cœlenterata*, VI. 107—a short article, purely scientific. Under this sub-kingdom, see Hydrozoa, XII. 547, and Actinozoa, I. 129.

IV. *Annuloida*—see Echinodermata, VII. 629.

V. *Annulosa.*—Under this sub-kingdom there may be many references. We give only a few:

Crustacea, VI. 632.

Arachnida, II. 271.

Myriapoda, XVII. 115, and V. 340.

Insecta, XIII. 141 (see Index, 224).

Chætognatha (marine worms), XXI. 148, and II. 52.

Annelida, II. 65.

VI. *Molluscoida*, IV. 188.—Under this sub-kingdom, see:

Polyzoa, XIX. 429.

Brachiopoda, IV. 188.

Tunicata, XXIII. 609; II. 53.

VII. *Mollusca*, XVI. 632; II. 54.—Under this sub-kingdom, refer to the following subjects:

Lamellibranchiata, XVI. 684.

Gastropoda, XVI. 641.

Pteropoda, XVI. 665.

Cephalopoda, VI. 735.

VIII. *Vertebrata*, XXIV. 178.—Under this sub-kingdom there might be hundreds of references given. The following articles and paragraphs will be found especially valuable:

Class I. Pisces. See *Ichthyology*, XII. 630; distribution of marine fishes, VII. 280, XII. 677; freshwater fishes,

XII. 669; fishes of America, I. 684; geographical distribution of fishes, XII. 668; fishes of prehistoric times, XII. 666; Agassiz's researches on fossil fish, I. 275; angling, II. 32; aquariums, II. 217. Several special articles may be of interest to the general reader, such as:

Fishes.

Sea fisheries, IX. 243.

Mackerel, XV. 160.

Cod, VI. 103.

Sturgeon, XXII. 611.

Fish-culture, XII. 664; XIX. 126; sup. 1280.

Angling, II. 32.

Izaak Walton, XXIV. 342.

David Starr Jordan, sup. 1755.

CLASS 2. AMPHIBIA, I. 750.

CLASS 3. REPTILIA, XX. 432; snakes, XXII. 189; crocodiles, VI. 592; alligators, I. 585.

CLASS 4. AVES. See Birds, III. 699; distribution of, III. 736, VII. 269; birds of America, I. 684. Turn to the special article, ORNITHOLOGY, XVIII. 2. The history of this science, as narrated in the first pages of this article, is especially interesting. The list of valuable works on birds, XVIII. 11–19, is very complete and valuable. The titles of hundreds of articles, referring to different birds might be given, but we quote only a few—for example, in volume VI. are such articles as the following: cockatoo, p. 98; condor, p. 253; coot, p. 341; cormorant, p. 407; crane, p. 546; crow, p. 617; cuckoo, p. 685; curassow, p. 709; curlew, p. 711—but the student needs no guide to find such articles as these.

Birds.

CLASS 5. MAMMALIA, XV. 347—a very comprehensive and scientific article, fully illustrated.

Classification of Mammalia, XV. 370.

History of Mammalia in former times, XV. 374. See also Palæontology, X. 319.

Mammalia.

Subclass Echidna, VII. 628.

Subclass Metatheria, XV. 378; marsupials, XIII. 838; kangaroo, III. 111.

Subclass Eutheria. Order Edentata. VII. 652; sloth, XXII. 161; armadillo, II. 543; aard-vark, I. 3; anteater, XV. 385, etc.

Order Sirenia, XV. 389; the manatee, XV. 456, etc.

Order Cetacea, V. 357; whale, XXIV. 523; porpoise, XIX. 521; dolphin, VII. 346, etc.

Order Insectivora, XV. 400.

Order Chiroptera, XV. 405; bats, III. 431.

Order Rodentia, XV. 415; squirrels, XXII. 437; rabbits, XX. 192; hares, XI. 479, etc.

Order Ungulata, XV. 421; elephant, VIII. 122; rhinoceros, XX. 521; horse, XII. 172; zebra, XXIV. 772; deer, VII. 23, etc.

Order Carnivora, XV. 432; cat, V. 202; dog, VII. 324; bear, III. 461; lion, XIV. 679; tiger, XXIII. 385, etc.

Order Primates, II. 108; lemur, XIV. 440; monkey, II. 148; man, XV. 444, and II. 107, etc.

MISCELLANEOUS READINGS.

The student who has followed this course of reading to the present point will now be prepared to notice the following important special articles:

Special Articles.

Anthropology, II. 107.

Animism, II. 55.

Biology, III. 679.

Evolution, VIII. 744.

Neo-Darwinism, sup. 2160.

Variation and selection, XXIV. 76.

Acclimatization, I. 84.

Reproduction, XX. 407.

Parthenogenesis, sup. 2302.

Embryology, VIII. 163. A valuable supplementary article, giving an account of all the latest advancements in this department of science, may be found in sup. 1186–1195.

Breeds and Breeding, IV. 244.

Hybridism, XII. 422.

Distribution of Animals, VII. 267.

Longevity of Animals, XIV. 857.

Animal Physiology, XIX. 10.

Animal Heat, sup. 189.

Animal Magnetism, XV. 277.

Animal Mechanics, XV. 772.

Sense-Organs, sup. 2682.

Segmentation of the Vertebrate Head and Brain, sup. 2664.

Instinct, XIII. 157.

Histology, XII. 4.

See *General Course of Reading in Biology*, for a more logical arrangement of these subjects.

CHAPTER XII.

READINGS IN BOTANY.

"In my garden I spend my days; in my library I spend my nights. My interests are divided between my geraniums and my books."—*Alexander Smith.*

THE reader who wishes to acquire a general knowledge of the subject of botany may begin by reading the chapter on the history of Botanical Science, IV. 79.

Great Botanists.

After this, read the biographies of the famous men who have contributed most to the advancement of this science. Among these the following are named as among the most important:

The elder Pliny, the first who made any extensive catalogue of plants, XIX. 224.

Andreas Cæsalpinus, the great Florentine botanist of the 16th century, IV. 633.

John Ray, the originator of the "natural system" of classification, XX. 300.

Tournafort, the foremost French botanist of the 17th century, XXII. 490.

Carl Linnæus, the real founder of the science, XIV. 671.

Jussieu, a famous French family of botanists, XIII. 788.

Robert Brown, the first British botanist to adopt and support the "natural system," IV. 385.

Asa Gray, the well-known American botanist, sup. 1447.

John M. Coulter, author of many of the articles on botanical subjects in the supplements to the *Britannica*, sup. 927.

After having read these biographical sketches, turn again to the special article on BOTANY, IV. 79–163, and notice the comprehensive manner in which the subject is there treated. This article comprises much more matter than is contained in the ordinary school text-books, and, as you will see, is profusely and beautifully illustrated with numerous full-page plates.

If it is your wish to make a thorough study of the anatomical structure of plants, their arrangement and classification, their distribution over the globe, and the uses to which they are subservient, you will find this article to be full of just the kind of information that you want. We will suppose, however, that you prefer, instead of studying every portion of this article, to use it for purposes of reference, and in order to supplement the information which you obtain from other sources. If this be the case, consult the "Index of Principal Subjects," IV. 162. But even if you are making only a hasty and superficial survey of this delightful science, you will find several chapters in this article worthy of your attention. Here are a few which you cannot afford to pass unnoticed:

Article on Botany.

Different parts of flowers, p. 126; essential organs of flowers, p. 134; respiration of plants, p. 119; pollen, p. 138; fertilization, p. 147; mosses, p. 107; lichens, p. 107; leaves, pp. 108–119; fruit, pp. 148–153.

One of the most important articles to aid in the systematic study of this science is that on CLASSIFICATION, by Prof. John M. Coulter, sup. 821–823.

The article on Ecology, sup. 1111–1113, a new department of plant physiology, is indispensable to all advanced students.

The article on Morphology of Plants, sup. 2105, is equally lucid, scientific, and comprehensive.

Other articles relating to botanical topics are numerous. Any lover of flowers who does not care to pursue a course of reading, may while away many pleasant hours in perusing chapters like the following:

Distribution of plants, VII. 286.
Propagation of plants, XII. 211, 234.
Reproduction of plants, XX. 423; sup. 2534.
Ancestry of plants, sup. 176.
Fertilization by insects, XIII. 142.
Linnæus's classification of plants, XIV. 672.
Morphology, XVI. 841.
Alternation of generation, sup. 143.
Assimilation in plants, sup. 269.
Physiology of plants, XIX. 43.
Insectivorous plants, XIII. 134.
Parasitic plants, XVIII. 264.

The article on the VEGETABLE KINGDOM, XXIV. 125–131, contains a complete classification of plants.

Read also:

Botanic Gardens, sup. 529.
Algæ, I. 507, sup. 123.
Fungus, IX. 827.
Lichens, XIV. 552.
Hepaticæ, XIV. 718.
Muscinæ, XVII. 65.

The Herbarium.

In pursuing the study of botany in a practical way, it is of course necessary that you should acquire a knowledge of plants at first hand, through personal observation. You must, therefore, make a collection of plants and arrange an herbarium for your own use and study. Full directions for doing this may be found in XI. 717.

And now, for further reference to plants, their culture,

uses, etc., see the chapters in this volume entitled, *The Gardener*, *The Fruit Grower*, and *The Woodsman*. In the first will be found a series of readings on the propagation and care of flowers and vegetables, and in the others some interesting and curious matter pertaining to trees, their modes of growth, their history, and their uses in the world's economy. It is well to remember that all the most important trees and plants in existence are the subjects of special articles in the *Britannica*. These may readily be found by consulting the Index volume.

Further Studies.

CHAPTER XIII.

READINGS IN GEOGRAPHY.

"What a world is this!"
—*As You Like It.*

I.—HISTORY OF GEOGRAPHY.

NO TEACHER of geography can afford to be without the *Encyclopædia Britannica.* In its pages are found a wealth and variety of matter pertaining to this science which it is impossible to find in any similiar work. By reference to its numerous geographical articles all difficult questions may be easily solved, and a store of information may be acquired which will be of infinite value at times when it is needed most.

History of Geography.

The teaching of geography began in very ancient times. The people of antiquity knew but very little about the earth, it is true; but they were anxious to perpetuate and extend that knowledge. And so among the Greeks, we find that it was customary to lay particular stress upon the teaching of the second book of the Iliad, for that book contains, in connection with the "catalogue of ships," a brief notice of the geography of the countries known at the time of the Trojan war. (See Homer, XII. 108; Iliad, XI. 137; Troy, XX. 637.)

The first person who attempted to reduce the science to a system was Eratosthenes (VIII. 519), and when we consider how limited was his knowledge of the subject we are surprised that he succeeded so well. He was followed by

Hipparchus (XV. 516), who proposed a method for determining the relative position of places upon the earth. Later came Ptolemy, the greatest of all the ancient geographers (XX. 87). His maps are the most ancient that have come down to us. (For a copy of his map of the world, see XV. 516.) Strabo, who was a little earlier, was perhaps even more scientific in his methods and conclusions than Ptolemy (XXII. 580).

The Middle Ages.

During the Middle Ages, geography was taught in the monastic schools. (See *trivium* and *quadrivium*, XX. 515.) In the course of study it was placed under the head of geometry; but the "geometry" of these schools consisted chiefly of an abridgment of Ptolemy's or Pliny's geography (X. 177; XIX. 224), to which the definitions of a few geometric forms had been added. For a thousand years there was absolutely no advancement made in either the knowledge of geography or the methods of teaching it.

Birth of Modern Geography.

The first modern impetus to discovery was given by the invention of the mariner's compass (VI. 225), and this of course was followed by a corresponding extension of geographical knowledge. Then came the invention of the astrolabe (XVII. 251). Then Prince Henry the Navigator began his career of exploration (XI. 672); Columbus gave a new impetus to the study of geography by discovering a new continent (VI. 171). Other bold adventurers sailed the seas and added their contributions to mankind's stock of knowledge concerning the world and its inhabitants. (See Hakluyt, XI. 378, and Purchas, XX. 114.)

But the history of the progress of geographical study is given in full, and with many interesting details, in the *Britannica*. See Geography, X. 175.

In obtaining a knowledge of the history of this subject,

the following articles will be found replete with information:

Globe, X. 680.

Maps, XV. 515; earliest forms of maps, XX. 91, 94; classes of maps, X. 191; Mercator's map, XVII. 253.

Promoters of Geographical Knowledge.

Navigation, XVII. 251.
Marco Polo, XIX. 408.
Varenius, XXIV. 69.
Rennell, XX. 399.

Ritter, XX. 570.

Petermann, sup. 2356.

See also Polar exploration since 1880, sup. 2408.

Henry M. Stanley, sup. 2777.

II. A VIEW OF THE WORLD.

On the pronunciation of geographic names, see sup. 1380.

The World as a Whole.

Every reader of the *Britannica* will of course understand that all articles descriptive of the continents, and indeed of every place of importance in the world, are to be found in their appropriate places in the different volumes of this work. Hence it is not necessary to encumber the pages of the GUIDE with mere lists of such articles. The titles of some of these articles may be grouped together, however, according to topics, in such a way as to indicate a number of brief courses of reading on geographical subjects. Begin, for example with the world as a whole. Read the article on Physical Geography, X. 210; then take up the following in their order:

The Globe, X. 680–685; the Relief Globe, sup. 1410.

Maps, XV. 515–523.

The Ocean, X. 211, 221, 282.

Atlantic Ocean, III. 15.

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III. MAPS IN THE BRITANNICA.

To the student of geography, one of the most instructive articles in the *Britannica* is that on the making of maps, XV. 515. The account therein given of the first essays in map-making is particularly interesting. This is followed by chapters on the development of map-making among the Greeks, XV. 516; on map-making among the Romans, page 517; on map-making in the middle ages, page 517; on nautical maps, page 518; on the maps of Ptolemy and

his successors, page 520; on the period of triangulations and geodetic surveys, page 522. In connection with this article, the curious reader will find a double-page colored illustration comparing Ptolemy's map of the world with the actual positions and distances, thus showing that, however inaccurate it may have been in details, it was nevertheless constructed according to strictly scientific methods, and in that respect was perfectly correct. An outline of Mercator's map of the world, drawn in 1569, is another interesting feature of this article, XV. 521. The Borgia map, X. 177, made in the 15th century, just before the discovery of the Western Hemisphere, is not only a great curiosity, but worthy of study, as illustrating the ideas of learned men in the middle ages concerning the shape and extent of the earth. The Lenox Globe, represented in IX. 681, and supposed to have been constructed in 1506–07, illustrates the next step in the advancement of geographical knowledge.

Historical.

The maps in the *Britannica*, if collected together within a single volume, would form one of the most complete and convenient atlases ever published. But since these maps are necessarily somewhat widely scattered through the twenty-four volumes of the *Encyclopædia*, few people, realize the extent and importance of this feature. In fact, there is no country of the globe that is not accurately represented in these pages.

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IV. MISCELLANEOUS GEOGRAPHICAL SUBJECTS.

Some interesting and curious selections worth reading in connection with the study of geography:

Geographic names, sup. 1380.

Interesting Topics.

The Sahara Desert, XXI. 149. Latest discoveries in, sup. 60.

Dead Sea, VII. 1.

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The Black Forest, XXIV. 669.

Gibraltar, English fortress in Spain, X. 583.

Polar Regions, XIX. 315, 330 and sup. 2408. These two articles give a complete history of arctic exploration and adventure from the earliest times to the present.

Recent explorations in Africa, sup. 59.

Famous Cities.

Famous Cities and Towns; Aix-la-Chapelle, I. 431; Alexandria, I. 493–496; Athens, III. 1; Baden-Baden, III. 226; Baghdad, III. 231; Benares, III. 555; Berlin, III. 593; Boston, IV. 72; Bristol, IV. 348; Brooklyn, IV. 370; Brussels, IV. 404; Cabul, IV. 623; Cairo, IV. 645; Calcutta, IV. 556; Cambridge, IV. 728; Chicago, V. 610; Edinburgh, VII. 658; Havana, XI. 524; London, XIV. 818 (see Index volume, page 265); Madrid, XV. 189; New Orleans, XVII. 402; New York, XVII. 457 (see Index volume, page 312); Paris, XVIII. 274 (see Index volume, page 332); Rome, XX. 833 (see Index volume, page 377); St. Petersburgh, XX. 190; Venice, XXIV. 141 (see Index volume, page 456); Vienna, XXIV. 219; Versailles, XXIV. 176; Jerusalem, XIII. 636; Ispahan, XIII. 393; Palmyra, XVIII. 198; Antioch, II. 130; Tyre, XXIII. 710; Constantinople, VI. 302; Mecca, XV. 669; Medina, XV. 817.

V. THE UNITED STATES.

See the special article, XXIII. 729–829, and the index on the last page. See also the historical and statistical view of the United States, sup. 2983. Both of these long articles are interesting and comprehensive, presenting a complete exposition of the geographical features of the country, together with an account of its history, industries, and natural resources.

Our Country.

Each of the States and Territories is treated in a similar manner, both in the body of the *Britannica* and also in the supplements. For example, for Arizona, see II. 538 and sup. 230; Arkansas, II. 539 and sup. 232. All these may be easily found without any further help from the GUIDE.

CHAPTER XIV.

A BRIEF COURSE OF READING IN METEOROLOGY.

"When it is evening, ye say it will be fair weather: for the sky is red. And in the morning, it will be foul weather to-day: for the sky is red and lowring."—*St. Matthew.*

METEOROLOGY, in its later and more strictly definite signification, is the scientific study of weather and climate, their causes, changes, relations, and effects. In the *Encyclopædia Britannica*, there is a comprehensive treatise upon this science written by Professors A. Buchan, of Edinburgh, and Balfour Stewart, of the Royal Society of London. It embraces seventy double-column pages, equal in matter to a duodecimo volume of more than 350 pages, and is fully illustrated. (See XVI. 114–184.) The supplementary article (sup. 2043) is equally valuable and comprehensive.

General Treatise.

A short and instructive course of reading in meteorology would include, besides the main points in these leading articles, the following references:

Air, I. 427.
Atmosphere, III. 28.
Ozone, XVIII. 113.
Temperature, XI. 555. (See general index.)
Thermometer, XXIII. 288.
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The Weather Bureau.

American Weather Bureau, sup. 2043.

Increase Allen Lapham, founder of the weather bureau, sup. 1834.

Flags used by the weather bureau, sup. 1617.

Terrestrial Magnetism, XVI. 159.

The magnetometer, XV. 238.

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Magnetic poles of the earth, XVI. 163.

Influence of the sun upon terrestrial magnetism, XVI. 167, 181.

Optical Meteorology (see Optics).

Aurora borealis, III. 90, II. 787.

CHAPTER XV.

READINGS IN MATHEMATICS.

"He apprehends a world of figures here.'

—*Henry IV.*

"Inquire about everything that you do not know; since, for the small trouble of asking, you will be guided in the road of knowledge."

—*From the Persian.*

IN the *Britannica*, each of the great branches of mathematical science is treated under its own head and at considerable length, and yet it is not presumed that any person will attempt to acquire the mastery of arithmetic, or algebra, or geometry from these articles. Here, if anywhere, the guidance of the living teacher and the assistance of specially prepared text-books are absolutely essential. The mathematical treatises in the *Britannica*, therefore, are valuable chiefly for occasional reference—they are not intended for general study, and certainly not for popular reading. Students and teachers, however, will frequently be able to derive valuable assistance from them in the solving of knotty problems or in the elucidation of difficult propositions. It is well, therefore, to remember where they can be found.

For Reference Only.

HISTORY OF MATHEMATICS.

The history of mathematics is a subject in which every student, whether he be a mathematician or not, must feel no little interest; and it is to a knowledge of this subject

rather than to the abstruse study of any particular branch of the science that the present course of reading points.

Ancient Mathematics.

It is supposed that the reader has already some general acquaintance with the elementary principles of mathematics, derived, as is ordinarily the case, from the text-books used at school. These readings from the *Britannica* will supplement his present knowledge, and perhaps encourage him to advance still farther in his acquisitions.

The best introduction to this course is the short article on MATHEMATICS, XV. 629. Read especially the historical parts, and omit, until a future time, such sections and paragraphs as seem too technical or too difficult for ready comprehension.

Notice what is said of Pythagorean mathematics, XX. 140, and of Hindu mathematics, XXI. 294.

Now read the historical portion of the article on ARITHMETIC, II. 524–526. The paragraphs relating to the different methods of notation are especially interesting, and may be read in connection with the article on Numerals, XVII. 626. The biographies of the following distinguished arithmeticians should be read next:

Great Mathematicians.

Archimedes, the greatest mathematician of ancient times, II. 380.

Apollonius of Perga, who flourished a little later than Archimedes, II. 187.

Diophantus, a Greek writer on arithmetic, 4th century, I. 511.

Maximus Planudes (died 1350), referred to in XVII. 627.

Robert Recorde (1558), author of an algebra entitled *The Whetstone of Witte*, and of one of the first arithmetics published in English, XX. 310.

Next turn to the history of algebra, I. 511–518. Notice

the list of writers on algebra, page 518. Read the following biographies of distinguished algebraists.

Algebra.

Girolamo Cardan (16th century), author of the second printed book on algebra, V. 90.

René Descartes, VII. 115.

Joseph Lewis Lagrange, XIV. 207.

Leonard Euler, demonstrator of the binomial theorem, VIII. 665.

Fourier, author of Fourier's theorem, IX. 490.

Sturm, author of Sturm's theorem, XXII. 612.

Leonard of Pisa, XIX. 125.

Geometry.

The history of geometry is very briefly told in X. 376. Concerning great geometricians, it will be well of course to refer first to Euclid, the greatest of them all. Read his biography, VIII. 655. Then notice the following:

Thales, XXIII. 218.

Theodosius, XXIII, 260.

Pythagorean contributions to the science of geometry, XX. 139.

Apollonius of Perga, II. 188.

Boetius on geometry, III. 857.

Legendre's work on geometry, XIV. 414.

Trigonometry.

For the history of Greek trigonometry, see XX. 87, under the article on Ptolemy; a brief notice of Indian and Arabian trigonometry is given in XXIII. 561, and an account of modern trigonometry in XXIII. 562. Of biographies, read the following:

Hipparchus, Greek mathematician, XI. 851.

John Napier, inventor of logarithms, XVII. 177.

Edmund Gunter, inventor of the terms cosine, cotangent, etc., XI. 330.

Sir Isaac Newton, XVII. 438.

Gottfried Leibnitz, XIV. 417.

Besides the mathematicians already mentioned, there are several others whose biographies are given in the *Britannica*. In order to acquire a complete knowledge of the history of the science, you should learn something about these men. Here is a partial list which, if you wish, you will be able to extend as you progress with the reading:

Men of Figures.

Pappus of Alexandria, XVIII. 229.
Alhazen (11th century), I. 572.
Henry Briggs (16th century), IV. 343.
Thomas Allen (16th century), I. 583.
Simon Stevinus (17th century), XXII. 531.
Alexander Anderson (17th century), II. 14.
Gaspard Monge (18th century), XVI. 738.
Thomas Simpson, XXII. 866.
Robert Simson, XXII. 876.
Jakob Steiner (19th century), XXII. 531.
George Peacock, XVIII. 443.
Christiaan Huygens (17th century), XII. 415.

For a popular course of reading in the history of mathematics, perhaps the foregoing is sufficient. Besides the four branches of the science already mentioned, there are others upon which the *Britannica* contains valuable and scholarly articles intended particularly for specialists in mathematics. Several additional articles also on mathematical subjects may be found under their own headings or by reference to the Index. The GUIDE ventures to name here the following, not that they should be included in any course of reading, but simply to remind the student of their presence in the *Britannica*, and to indicate where he may find them if occasion should require that he should refer to them:

Mathematical Topics.

Abacus (arithmetical device), I. 4.
Calculating machines, IV. 654.
Squaring the circle, XXII. 433.
Annuities, II. 72.
Astronomy, XXIV. 85.
The Almagest, I. 589.
Angles, II. 29.
Curve, VI. 716.
Calculus, XIII. 5.
Functions, IX. 818; XIV. 209, 413.
Geodesy, X. 163.
Gauging, XVI. 28.
Logarithms, XIV. 772.
Measurement, XV. 659.
Mechanics, XV. 676.
Quaternions, XX. 160.
Surveying, XXII. 695.
Variations, XXIV. 85.
Probability, XIX. 768.
Projections, XIX. 793.
Surface, Congruence, Complex, XXII. 668.

CHAPTER XVI.

TWO COURSES OF READING IN PHYSICS.

COURSE I.

PHYSICAL science originally had reference to a knowledge of whatever exists in the material universe, as distinguished from metaphysical science, or a knowledge of the laws of mind. In this sense it was synonymous with natural science. With the progress of scientific study, however, these two terms have come to have, each a distinctive meaning of its own. Natural science now has reference more particularly to the study of organized bodies and their development. Physical science investigates the various phenomena observed in things without life; in other words, it is a study of the laws of matter.

Physical Science.

Until recently the popular name for physical science was "natural philosophy."

As now generally regarded, it includes two branches, mechanics and physics.

For readings in MECHANICS, see the article on that subject in the fifteenth volume of the *Encyclopædia Britannica*. See also the chapters in this GUIDE entitled *The Mechanic* and *The Machinist*.

Since any knowledge of physics implies a study of the laws of matter, let us at first take a general survey of some of the most important of those laws.

What is matter? We do not know. But to gain some ideas of the extent of human knowledge on this subject, read the articles ATOM, III. 36, and Molecule, XVI. 610: VII. 215.

Matter.

Some knowledge of the properties which matter possesses in itself may be acquired by studying the following topics:

Molecules, XVI. 610; III. 38.

Inertia, XV. 676.

Constitution of Bodies, VI. 310.

Attraction, III. 63; XI. 66; XV. 702.

Adhesion, I. 153.

Elasticity, VII. 796.

Density, XV. 698; XII. 536.

Compressibility, VII. 815.

Divisibility, III. 37; sup. 1054.

The relative properties of different kinds of matter are described in such articles as these:

Diffusion, VII. 214.

Cohesion, V. 56.

Gravitation, XI. 66; the law of gravitation II. 780; Newton's discovery of this law, II. 755.

Capillary action, V. 56.

A consideration of the properties of matter relative to different forms of energy leads to a study of the following subjects:

Conductivity, XI. 578, 586 (thermal), and VIII. 52 (electric).

Specific gravity, XII. 536; Specific heat, XI. 576.

Color, VIII. 823.

Radiation, XX. 212.

The laws and phenomena of matter are treated under many distinct divisions; and hence in physics we find several related sciences, such as:

(1) HYDROMECHANICS, or the laws of liquids, whether in equilibrium or in motion, XII. 435. Here are included:

Hydromechanics.

Hydrostatics, referring to liquids at rest, XIX. 2; XII. 440.

Hydraulics, or the action of liquids in motion, XII. 459.

Closely related to these subjects is that branch of mechanics called hyrodynamics, which is discussed in connection with them, XII. 435; XIX. 241.

(2) PNEUMATICS, or the science which treats of the properties of air and of gases in general, XIV. 240.

Many articles on related subjects might be read in connection with a study of this branch. The following will be found interesting and instructive:

Pneumatics.

Gases, VI. 310; diffusion of, VII. 215; molecular theory of, III. 38; density of, XII. 460; laws of, V. 468; elasticity of, VII. 801.

Air, I. 427; aerostatics, IX. 308; aeronautics, I. 185; atmosphere, III. 28.

(3) ACOUSTICS, or the science which treats of the nature, phenomena, and laws of sound, I. 100 (see general index); see also Music, XVII. 77, and many of the references in the chapter entitled *The Musician*, in this GUIDE.

Acoustics.

Voice, XXIV. 273.

Telephone, XXIII. 127.

Phonometer, sup. 2369; Phonoscope, sup. 2369.

(4) OPTICS, or the science of light, XVII. 798. In connection with this subject read the following:

Optics.

Light, XIV. 577; aberration of light, I. 47; reflection of light, XVI. 64; the velocity of light, XX. 620; polarization of light, sup. 2412; the theory of light, XXIV. 421, 444–447.

Mirror, XIV. 587; XVI. 499.

Lenses, XIV. 593.
Microscope, XVI. 258.
Telescope, XXIII. 135; Galileo's, II. 753, X. 31; Lord Rosse's, XX. 855; Herschel's, XI. 766.
Spectacles, XXII. 372.
Spectrometer, XVII. 800.
Spectroscope, XXII. 373.
Camera, IV. 740, 741; XVIII. 839.
Eye, VIII. 816.
Aurora polaris, III. 90, 92, 93.
Rainbow, XI. 399.
Optical illusions, II. 205.
Vitascope, sup. 3057.
Mirage, XIV. 600.

(5) HEAT, XI. 554. The reading of this long and very scholarly article may be supplemented by a study of the following references:

Temperature (see general index).
Thermometer, XI. 561.
Theory of heat, XIX. 2.

Heat.

Conduction of heat, XX. 212.
Convection of heat, XX. 212.
Heat as the equivalent of force, XV. 649.
Power of heat in mechanics, XV. 773.

Steam, XI. 560; properties of, XXII. 483.

(6) *Electricity and Magnetism.* See the chapter entitled *The Electrician*, in this GUIDE.

COURSE II.

The late Professor J. Clark Maxwell, in the article on physical science which he contributes to the *Encyclopædia Britannica*, presents a classification somewhat different from the above. Physics includes what he calls the secondary physical sciences. A study of these sciences embraces

the acquisition of knowledge relative to the following topics, and in the order here named :

Weight and Motion.

(1) *Theory of gravitation* (XI. 66 ; III. 64), with discussions of the weight and motion of bodies near the earth. See Motion, XV. 752, and particularly XV. 701, 715, 746.

(2) *Theory of the action of pressure and heat* in changing the dimensions and state of bodies.

Heat.

(a) Physical states of a substance—gaseous (VI. 310), liquid (VI. 311 ; XII. 459), solid (XIX. 240).

Elasticity, VII. 796 ; of gases, VII. 801 ; of liquids, VII. 801 ; of solids, VI. 310.

Viscosity, VII. 801 ; of gases, XVI. 618 ; of solids, XXII. 598.

Plasticity (of solids), XVI. 65 ; Capillarity, I. 153.

Tenacity (of solids), XVI. 378.

Cohesion and adhesion, I. 153.

(b). Effects of heat in raising temperature (XV. 773), altering size and form (XVI. 66, XIX. 2), changing physical state (XXIII. 283 ; XXII. 473).

(c). Thermometry, XI. 558 ; XXIII. 288.

(d). Calorimetry, XX. 132 ; XI. 555.

(e). Thermodynamics, XXIII. 283 ; XXII. 479 ; XV. 649.

(f). Dissipation of energy (XXIII. 285) by diffusion of matter, etc.

Diffusion of motion (XXIII. 543 ; VIII. 207) by internal friction of fluids (XII. 482 ; XIX. 247).

Diffusion of heat (VII. 217) by conduction (XX. 212).

Sound.

(g). Theory of propagation of sound, I. 100. Vibration of strings, etc., XVII. 105 ; I. 116.

3. *Theory of radiance.*

(a). Geometrical optics, XVII. 798.

Theory of conjugate foci, XVII. 799.

Optical instruments, XVII. 801, 806.
(b). Velocity of light, II. 797; XXIV. 458.
(c). Prismatic analysis of light, XIV. 519, 612.
Radiance. Spectroscopy, XXII. 373.
Fluorescence, XIV. 579, 602.
(d). Diffraction of light, XXIV. 430, 442.
(e). The wave theory of light, XIV. 603.
(f). Polarized light, XIV. 610.
(g). Theory of primary colors, VIII. 823.
The spectrum, XIV. 592, 595.
4. *Electricity and magnetism.*
(a). Electrostatics, VIII. 24; VIII. 14.
(b). Electrokinematics, or distribution of currents in conductors (see index VIII. 105).
Electrolysis, VIII. 106.
Magnetism, etc. Electro-chemistry, VIII. 13, 112; VI. 846.
(c). Magnetism, XV. 219.
Terrestrial magnetism, XVI. 159.
Diamagnetism XV. 244, 262; IX. 285.
(d). Electro-magnetism, VIII. 66.

CHAPTER XVII.

READINGS IN THE STUDY OF MAN.

"The proper study of mandkind is man."—*Pope*.

Divisions of the Subject.

A COMPLETE study of Man in all his various relations to the animal and spiritual world would embrace an investigation of many branches of knowledge, each occupying a distinct field of its own, but each dependent to a greater or less extent upon its kindred sciences. Among these branches the following are the most important:

1. Anatomy, which treats of the structure of the human body (see I. 799).

2. Physiology, which treats of the functions and relations of the different parts of the body, XIX. 8.

3. Psychology, which investigates the operations of the human mind (see references in chapter entitled *The Teacher*).

4. Philology, which deals with the general principles of language (see chapter on that subject in this GUIDE).

5. Ethics, which treats of man's duty to his fellow-men (see references in chapter on *Philosophy* in this GUIDE).

6. Sociology, which treats of the origin and development of human institutions, VIII. 619; XVIII. 796; XIX. 347.

7. Religion, which deals with man's relations to the spiritual world, and his duties to God (see the chapter entitled *The Preacher and Theologian*).

8. Anthropology, the natural history of man.

9. Ethnology or Ethnography—properly a subdivision

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of Anthropology—which deals with the subdivisions of the human race, such as hordes, clans, tribes, nations, etc.

10. Archæology and Antiquities, which treat of the early history of man, and of the remains of ancient art.

11. History (see Chapter VI. in this GUIDE).

It is proposed to indicate in the present chapter a few courses of reading from the *Britannica* which shall cover only the subjects numbered 8, 9, 10, and 6, above.

1. ANTHROPOLOGY.

Origin of Man.

Let us take as the basis of our studies the comprehensive and scholarly article by Professor E. B. Tylor in volume II., pages 107–123. As to man's place in nature, refer to the article Animal Kingdom, II. 49. Certain portions also of the following articles may be read: Physiology, XIX. 8; Histology, XII. 4. See, also, XV. 444, and the articles on

Evolution, VIII. 744.

Heredity, sup. 1568.

Charles Darwin, sup. 989.

Ape, II. 148.

Man and Monkeys, II. 107.

Concerning the origin of man, see the following: I. 136; X. 291; II. 333, 341; also the myths of his creation, III. 141; XVII. 157. Read the section on this subject in II. 110.

The chapter on the races of mankind, II. 111–115, may be supplemented by the references under Ethnology, below.

Concerning the antiquity of man, read the sections in X. 368, and II. 115; then see the references under Archæology, below.

Language.

Read the section on language, II. 117–120; also the following:

Evolutionary theories of language, VIII. 769.

Relation of language to thought, XX. 75.

Relation of language to mythology, XVII. 137.

(See Chapter VIII. in this volume).

Culture.

Study next the development of civilization and culture. Read section vi., volume II., pages 120–123; and also what is said of the earliest seats of civilization, II. 342, and of Buckle's theory of civilization, IV. 421.

II. ETHNOLOGY.

Read by sections the article entitled Ethnography, VIII. 613–626. (Observe the distinction between Ethnography and Ethnology, p. 613). The following are a few of the articles or sections which will be found interesting in connection with this study.

Races.

The Family, IX. 17.

Tribes among Primitive Races, IX. 20.

Races of mankind, II. 111.

Ages of man, II. 122, also II. 336–341.

Food, VIII. 616.

Fire, IX. 227–232.

Religious Development (see chapter entitled *The Preacher and Theologian*, in this volume).

Myths and Legends, VIII. 623; VIII. 837; XVII. 135; XXIII. 28; IX. 358.

Magic, XV. 199.

Superstitions, VIII. 623 (see also the references named in Chapter XX. of this GUIDE).

Character-istics.

For the characteristics which distinguish man in different countries, see under the head of each country. For example, for Man in Africa, see the article Africa, I. 260; so also we shall find,

Man in Algeria, I. 564;

Man in America, I. 686;

Man in Arabia, II. 245;

Man in Asia, II. 697;
Man in Australia, III. 118;
and so on, for every country of importance in the world.

Some curious races are also described in an entertaining way:

The Natives of the Andaman Islands, II. 11.
The Hottentots, XII. 309.
The Bushmen, IV. 575.
The Bongo, IV. 32.
The Ainos of Japan, I. 426.
The Dyaks, IV. 58.
The Czechs, VI. 754.
The Copts, VI. 354.
The Cossacks, VI. 448.
The Natives of Anam (ugliest in the world), VI. 95.
The Esquimaux, VIII. 543.
The Natives of Polynesia, XIX. 422.
The Pueblo Indians, sup. 2473.
Half breeds of Manitoba, sup. 1509.

Customs.

Concerning the origin of justice and morals, and their development among primitives peoples, see VIII. 624. Also marriage, XV. 565; IX. 18; totemistic marriage ceremonies, XXIII. 470; marriage among ancient Mexicans, XVI. 213; myths relating to marriage, XVII. 158.

Cannibalism, IV. 807.
Totemism, XXIII. 467.
Ghost-dance of Indians, sup. 1392.
See Frank H. Cushing, sup. 971.

See also the readings in SOCIOLOGY, suggested in this GUIDE.

III. ARCHÆOLOGY AND ANTIQUITIES.

Under this head we shall include a brief survey of a few

of the more interesting antiquities described in various articles in the *Britannica*. No attempt will be made at classification. Read first the brief article on Antiquities, II. 134, and then turn to Archæology, II. 333. This latter article may be studied by sections in connection with the supplementary article on the same subject, sup. 216. See also Egyptology, sup. 1127; W. M. Flinders Petrie, sup. 2358.

Antiquities.

Then read, as occasion requires, or as inclination may direct, the following articles, which have been selected on account of their interest to general readers:

Antiquity of Man, II. 115.
Antiquities of America, I. 692.
The Mound Builders, III. 390.
Ancient American Architecture, II. 450.
Ancient Ruins in Yucatan, XXIV. 758.
Antiquities of Egypt, VII. 767–784.
Antiquities of Peru, I. 696.
Wall of Romulus, XX. 812.
Wall of Servius, XX. 813.
Wall of Antoninus, II. 139.
Wall of Hadrian, XI. 723.
Wall sculptures of Babylon, XVII. 34.
Wall decorations in Pompeii, XVII, 37–41.
Great Wall of China, V. 638, 644.
Baalbec, III. 176.
The Temple of Bel, III. 183.
Nineveh, XVII. 511; II. 397.
Schliemann's Researches in Ancient Troy, II. 341; sup. 2647.
Olympia, Recent Discoveries at, XVII. 765.
Mycenæ, Ancient Remains of, XVII. 115.
Cylopean Masonry, II. 346, 401.
Remains of Masonry in Ithaca, XIII. 517.

Tiryns, XXIII. 407.

General Di Cesnola, sup. 738, and his discoveries in Cyprus, VI. 750, note.

Temple of Poseidon, XVIII. 133.

The Palladium, XVIII. 188.

Painted Tombs of Corneto, VI. 423.

Mummies, XVII. 20.

Pompeii, XIX. 444.

Herculaneum, XI. 723.

Cave Animals and Cave Man, V. 266.

Prehistoric Stone Circles, II. 383.

Stone Monuments, Dolmens, etc., XXI. 50.

Stonehenge, XXII. 576.

Ancient Monuments in Peru, II. 451.

Stone Monuments in Polynesia, XIX. 428.

Animal Mounds of Wisconsin, XXIV. 618.

Druidic Monuments, XXI. 52.

Ancient Barrows, III. 397.

Old Roman Roads, XX. 582.

The Catacombs, V. 206–216.

Ancient Stone Weapons, II. 553.

Ancient Inscriptions, XIII. 114–133.

Ancient Bottles, IV. 167.

Ancient Bracelets, IV. 187.

Ancient Bricks, IV. 279.

Ancient Brooches, IV. 369.

Ancient Lamps, XIV. 247.

Ancient Mirrors, XVI. 501.

Ancient Baths, III. 434.

Ancient Mosaics, XVI. 850.

Ancient Relics, XX. 355.

Relics in connection with Christian thought and practice, XX. 357.

Remains of antique art, II. 134.

Ancient rings; earliest existing rings, cylinders, Roman rings, XX. 560; Episcopal rings, poison rings, XX. 561.

Ancient Plate (Assyrian, Etruscan, etc.), XIX. 179–182.

Ancient Writing Materials, XVIII. 143, 232.

Ancient Pottery, III. 189.

Ancient Textiles, Weaving in Prehistoric Times, etc., XXIII. 206.

Antiquarian Societies, II. 135.

Archæological Societies, XXII. 221.

Asiatic Societies, sup. 265.

CHAPTER XVIII.

READINGS IN PHILOSOPHY.

Definition.

PHILOSOPHY is a term the meaning and scope of which have varied greatly according to the usage of different authors and different ages. The aim of the courses of reading which we shall here attempt to indicate, is to afford a general view of the history of philosophic ideas from the earliest times to the present, with a brief notice of some of the famous schools of philosophy, and of their influence upon modern thought. Of the large number of articles in the *Britannica*, which may be utilized for this purpose, only those will be named which are the most essential to a general knowledge of the subject, or which are deemed to be of the greatest interest to the young student or the casual reader.

I. ETHICS.

Ethics.

The special article on Philosophy, XVIII. 791, may be made the starting point and basis for these studies. This article, leaving controversial details as far as possible in the background, attempts to explain generally the essential nature of philosophy, and to indicate the main divisions into which, as a matter of historical fact, its treatment has fallen. After reading the first and second divisions of this article, pp. 791–793, let us make a brief study of the lives of some of the famous ancient philosophers, and of the different schools which they founded.

But first, turn to the article on ETHICS, VIII. 574, and read the introductory paragraphs defining and giving a

general account of this division of the subject. Read next the article on Thales, the first philosopher of Greece, and the founder of Greek astronomy and geometry, XXIII. 217. Then read the following articles in their order:

Pythagoras (580–500 B. C.) and Pythagoreanism, XX. 137.

Heraclitus of Ephesus (530–470 B. C.), XI. 681.

Democritus (470–362 B. C.), VII. 59.

The Sophists, XXII. 263; The Age of the Sophists, VIII. 576.

Ancient Philosophers.

Socrates (470–399 B. C.), XXII. 231; Socratic Schools, VIII. 578.

Aristippus, II. 506. The Cyrenaic School, VI. 750.

The Cynics, VI. 745, VIII. 578; Antisthenes, II. 136; Diogenes, VII. 245.

Plato, XIX. 194, VIII. 579; Platonism, I. 68; Plato and Aristotle, VIII. 580; Plato's school, VIII. 587; the Academy, I. 68.

Aristotle, II. 510; Aristotle's Ethics, VIII. 581; his logic, XIV. 784; his metaphysics, XVI. 79; the Peripatetics, XVIII. 545.

Stoicism, VIII. 583; XXII. 561.

Epicurus, VIII. 472, 586.

Marcus Aurelius, III. 86.

Neoplatonism, XVII. 332; VIII. 587.

Mysticism, XVII. 128.

Christian ethics, VIII. 588; faith, VIII. 589; love and purity, VIII. 590.

Alexandrian school, I. 498.

St. Augustine, Christian philosopher, III. 75.

St. Ambrose, I. 662.

Scholastic philosophy, XXI. 117.

Thomas Aquinas, II. 231.

Albertus Magnus, I. 453.
Abélard, I. 34.
Bernard of Clairvaux, III. 601.
Grotius, XI. 217.

Modern Philosophers.

Hobbes and his "Leviathan," XII. 31.
The Cambridge Moralists, VIII. 597.
Henry More, XVI. 814.
John Locke, XIV. 751.
Shaftesbury, XXI. 731.
Bernard de Mandeville, XV. 472.
David Hume, XII. 346.
Adam Smith, XXII. 169.
The Intuitional School, VIII. 603.
Dugald Stewart, XXII. 546.
Utilitarianism, VIII. 606; sup. 3013.
William Paley, XVIII. 181.
Jeremy Bentham, III. 575.
John Stuart Mill, XVI. 307; sup. 3014.
Auguste Comte, VI. 229.
Immanuel Kant, XIII. 844.
Georg Friedrich Hegel, XI. 612.
Herbert Spencer, sup. 2764.
Ralph Waldo Emerson, I. 729; sup. 1195.
Transcendentalism, sup. 2935.

Finally, this study of ethics may be brought to a close by reading the concluding paragraph on that subject in XVIII. 796.

II. METAPHYSIC.

Definition.

Metaphysic is "the science which deals with the principles which are presupposed in all being and knowing, though they are brought to light only by philosophy." According to Aristotle it includes also theology, the science of God. It is treated at

considerable length by Professor Caird of Glasgow, in XVI. 79–114.

References.

See the references given above for Aristotle, the Sophists, the Socratic school, Neoplatonism, Kant, Locke, etc. Read also the following articles:

Bacon, III, 200; XXIII. 244.
Descartes, VII. 115.
Fichte, IX. 134; XX. 290.
Spinoza, XXII. 399.
Animism, II. 55.
Realism, XXI. 419; sup. 2515; see also Hamilton, XI. 417; Schopenhauer, XXI. 457; and Universals, XXI. 418 *et seq.*
Idealism, sup. 1649.
Altruism, sup. 145.
Analytic Judgments, I. 797.
Association of Ideas, II, 730.
Antinomy, II. 130.

III. PSYCHOLOGY.

Psychology, "the science of the phenomena of the mind," is the subject of a long and very learned article by Professor Ward, of Cambridge University, XX. 37–85. It may be read by sections with collateral references to the articles treating of the lives and works of the men who have done most for the development of this science.

Modern Psychology.

See the references given above for Locke, Hume, Mill, and many others.

Read also the following articles:

Berkeley, III. 589.
Bain, I. 223; III. 534.
Herbart, XI. 718.

Leibnitz, XIV. 417.
Herbert Spencer, II. 733.
Sir William Hamilton, XI. 416.
Association of ideas, II. 730.
Analytic judgments, I. 797.
Belief, III. 532.
Imagination, XX. 57.
Feeling, XX. 40, 66, 74.
Abstraction, I. 58.
Absolute, I. 57.
Analysis and Synthesis, I. 796.
Attention, III. 52, etc.

Psychology in relation to ethics, VIII. 574; in relation to logic, XIV. 780; to metaphysics, XVIII. 848; to evolution, VIII. 766; to religion, XXIII. 274.

Aristotle's Psychology, II. 522.
Plato's, XIX. 201.
The Stoics', XXII. 565.
Xenocrates's, XXIV. 719.
Hume's, XII. 352.
Cousin's, VI. 525.
Descartes', VII. 126.
Hegel's, XI. 620.
Leibnitz's, XIV. 422.
Kant's, XIII. 848.
Lewes's, XIV. 491.

See additional references to this subject in the chapter entitled *The Teacher*, in this GUIDE.

IV. LOGIC.

Logic is the systematic study of thought. The subject is discussed in a comprehensive and scholarly article by Professor Adamson, of Manchester, in Volume XIV. of

the *Britannica*, pages 780–803. Hamilton's contributions to the development of this science are briefly noticed in XI. 419.

Logic.

John Stuart Mill's in XVI. 312.
Whately's in XXIV. 530.
Hutcheson's in XII. 411.
Condillac's in VI. 251.
Gilbert de la Porrée's in X. 592.
De Morgan's in VII. 66.
Hegel's in XI. 619.
Kant's in XIII. 852.
Leibnitz's in XIV. 422.
Lully's in XV. 64.

The various terms and distinctive expressions used in the science are defined and discussed, sometimes separately, each under its own head, and sometimes in a comprehensive treatise upon some general topic. For example:

Terms.

A priora and a posteriora, II. 214.
Reductio ad absurdum, I. 59.
Accident, I. 83.
Analogy, I. 791.
Reality, XIV. 797, 798.
Analysis, I. 793, 796.
Reason, XIV. 780.
Association of Ideas, II. 730–734.

See the references given above for Aristotle, Kant, Mill, Hegel, etc.

Read also the following articles or paragraphs:
Lotze, XV. 12,
Ueberweg, XXIII. 716.
Condillac, VI. 249.
Ulrici, XXIII. 721.
Analytics, XIV. 785.

Dialectics, XIV. 786; II. 516.
Deduction, I 797.
Induction, I. 797; XIV. 785.
Syllogism, XIV. 789.

V. AESTHETICS.

By Aesthetics is generally meant the science of the beautiful, with its allied conceptions and emotions. A brief survey of the subject and the various problems which its study involves is given in a special article by Professor James Sully in I. 212–224. After reading the first two sections of this article, see the references given above for Socrates, Plato, Aristotle, and the other philosophers mentioned under the head of Ethics. Read next the chapter on the history of aesthetic systems, pp. 214–224.

The Beautiful.

This course of reading may be continued with a study of the short section on aesthetics, XVIII. 795.

Edmund Burke's work on the sublime and beautiful is briefly noticed in IV. 540. Jouffray's theory that the beautiful when considered apart from utility is valueless, is referred to in XIII. 194. See also:

The nature of beauty, IX. 194.
Hutcheson on beauty, XII. 411.
Plato on beauty, XIX. 201.

VI. SOCIOLOGY.

Philosophers will agree in telling us that for the content of morality we must refer, in great part, to the experience crystallized in laws and institutions, and to the unwritten law of custom, honor, and good breeding, which has become organic in the society of which we are members. Sociology, or the science of the development of human society, is

Human Society.

brought therefore within the scope of philosophy. In some of its aspects it may indeed be regarded as a branch or subdivision of ethics. Many articles in the *Britannica* relate, more or less directly, to this interesting subject. The following may be studied with profit:

Antiquity of Man, II. 115.
Development of Civilization, II. 120.
Development of Culture, II. 121.
Family Development, VIII. 618.
Social Development. VIII. 619.
Association and Evolution, VIII. 607.
Relations of sociology to economics, XIX. 347.
Sociological conceptions of Comte, VI. 235.
Herbert Spencer's Social Statics, sup. 2766.
Sociology in relation to Statistics, XXII. 464.
See also Sociological Societies, XXII. 226.

In connection with these readings, make use of the references to ethnology given in this GUIDE.

CHAPTER XIX.

READINGS FOR BIBLE STUDENTS.

"This course of reading Scripture and good books will be many ways to your great advantage."—*Richard Baxter*, 1660.

SUNDAY-SCHOOL teachers, ministers of the Gospel, theologians, and all students of the Bible will find the *Encyclopædia Britannica* replete with information concerning all subjects connected with Bible history, biography, or geography. There is scarcely a proper name in the Old Testament or the New that is not the subject of a special article. The History of the Bible itself, with that of the critical problems connected with the books which compose it, is ably and fully discussed by Professor W. Robertson Smith in a fourteen-page article, III. 634-648. Many of the books composing the Bible are treated separately in a similar comprehensive manner. See the following:

Bible History.

Pentateuch and Joshua, XVIII. 505–514. This article embraces a complete survey of the first six books of the Bible, with a careful discussion of the Mosaic law, and a notice of the most recent criticisms and opinions. In connection with this article it will be interesting to read what is said of Philo's "Exposition of the Mosaic Law," XVIII. 763.

Books of the Bible.

The book of Judges, XIII. 763, and XIII. 400.

The book of Ruth, XXI. 110.

The books of Samuel, XXI. 252.

The First and Second Books of Kings, XIV. 83.

Chronicles, V. 706.

The Books of Ezra and Nehemiah, VIII. 831.
The Book of Esther, VIII. 560.
The Book of Job, XIII. 697, 420.
The Book of Psalms, XX. 29, and XII. 589.
The Book of Proverbs, XIX. 879.
The Book of Ecclesiastes, VII. 623.
Song of Solomon, V. 32.
Prophet, Prophets, XIX. 814.
Lamentations of Jeremiah, XIV. 240.
The Book of Daniel, VI. 803.
The Old Testament Canon, V. 1.
The Gospels, X. 789.
Acts of the Apostles, I. 123.
Epistles of St. Paul, III. 642.
Epistle to the Hebrews, XI. 602.
Epistle to the Romans, XX. 727.
Epistles to the Corinthians, VI. 399.
Epistle to the Galatians, X. 19.
Epistle to the Ephesians, VIII. 458.
Epistle to the Colossians, VI. 164.
Epistles to the Thessalonians, XXIII. 297.
Epistles to Timothy and Titus, XVIII. 348.
Epistle to Philemon, XVIII. 741.
Epistle of St. James, XIII. 553.
Epistles of St. Peter, XVIII. 697.
Epistles of St. John, XIII. 707.
Epistle of St. Jude, XIII. 761.
The Book of Revelation, XX. 496.
The New Testament Canon, V. 7.
Apocalyptic Literature, II. 174.
The Apocrypha of the Old Testament, II. 180; the Book of Baruch, III. 404; Esdras VIII. 541; Judith, XIII. 765; Maccabees, XV. 131; Tobit, XXIII. 428.
Israel, XIII. 396.

Miscellaneous Bible Topics.

Moses, XVI. 860.
David, VI. 836.
Jews, XIII. 679.
Bible Concordance, VI. 240.
Bible Glosses, X. 687.

Versions.

Versions of the Bible:
English, VIII. 381; Wycliffe's, XXIV. 710; Tyndale's, XXIII. 675; Coverdale's, VI. 531; Luther's, XV. 76; Geneva, VIII. 387; the Septuagint, XXI. 667.
Inspiration of the Bible, XIII. 154.
Circulation of the Bible, III. 634; sup. 442–456.

The above-named articles, many of them long and all the work of Biblical scholars of high repute, if read in the order named will constitute a complete course of study in Bible history and criticism. Theologians and advanced students will recognize at once their great interest and value.

Shorter Articles.

The *Britannica* also contains innumerable briefer articles on subjects concerning which every Bible reader desires to be informed. The following is a partial list of such articles arranged alphabetically, according to the volumes in which they occur:

Volume I.—Aaron, the first high priest, p. 3; Abel, the first man slain, p. 33; Abimelech, the title of certain kings in Palestine, p. 49; Abraham, the "father of the faithful," p. 52; Absalom, the rebellious son of David, p. 56; Adam, the first man, p. 135; Ahab, the wicked king of Israel, p. 420; Ahasuerus, king of Persia, p. 421; Amos, one of the prophets, p. 747.

Amalekites, p. 651; Ammonites, p. 742, and Amorites, p. 747—tribes at war with the Israelites.

Abana and Parphar, p. 4; Adullum, p. 166, and Ai, p. 424—rivers mentioned in the Old Testament.

Volume II.—Athaliah, p. 827; Asa, p. 153; Apocrypha, p. 180; Ark of the Covenant, p. 539; Ararat, p. 309.

Volume III.—Balaam, p. 258; Baruch, p. 404; Belshazzar, p. 553.

Volume IV.—Cain, p. 642; Canaanites, p. 763; Cana of Galilee, p. 762.

Volume V.—Canticles, p. 32; Chronicles, p. 706.

Volume VI.—Daniel, p. 803; David, p. 836.

Volume VII.—Deluge, p. 54; Decalogue, p. 15.

Volume VIII.—Eli, p. 133; Elijah, p. 134; Elisha, p. 140; Emmaus, p. 177; Enoch, p. 449; Esau, p. 533; Esdras, p. 541; Esther, p. 560; Eve, p. 733; Ezekiel, p. 828.

Volume X.—Galilee, p. 27; Gath, p. 108; Gilead, p. 594; Goshen, p. 788; Gideon, p. 588; Gog, p. 738; Bible Glosses, p. 687; the Gospels, p. 789.

Volume XII.—Hittites, p. 25; Hosea, p. 295.

Volume XIII.—Isaiah, p. 377; Israel, p. 396; Jeremiah, p. 626; Jesus Christ, p. 656; Jesus, son of Sirach, p. 672; Job, p. 697.

Volume XIV.—Lamech, p. 238.

Volume XV.—Manna, p. 493; Mark, p. 551; Mary, p. 589; Matthew, p. 633.

Volume XVI.—Messiah, p. 53; Micah, p. 224; Michael, p. 226; Midian, p. 284; Moab, p. 533; Moloch, p. 695; Moses, p. 860.

Volume XVII.—Nahum, p. 165; Naphtali, p. 174; Nathanael, p. 242; Nehemiah, p. 320; Nimrod, p. 511; Nebuchadnezar, p. 309.

Volume XVIII.—Paul, p. 415; Peter, p. 693; Pharaoh, p. 730; Philemon, p. 741; Philip, p. 742; Philistines, p. 755.

Volume XX.—The land of Rameses, p. 265.

Volume XXI.—Sabbath, p. 124; Samaria, p. 243; Samaritans, p. 244; Samuel, p. 252; Samson, p. 252.

Volume XXII.—Simeon, p. 77; Simon Magus, p. 78; Sinai, p. 88; Solomon, p. 251; Synagogue, p. 811; Susa, p. 722.

Volume XXIII.—Thomas, p. 308; Timothy, p. 399; Titus, p. 420; Tobit, p. 427.

Of the articles which relate to the geography of the Bible, the following are a few of the most important:

Sinai, celebrated as the place where Moses received the law, XXII. 88.

Palestine, the "Promised Land," XVIII. 170, and XIII. 400.

Jerusalem, the holy city, XIII. 636.

Dead Sea, together with an account of the two cities, Sodom and Gomorrah, which are said to have occupied its site, VII. 1.

Bible Geography.

Hebron, the ancient capital of Judea, XI. 608.

Bethlehem, the city of David, III. 617.

Bethany, the "town of Mary and Martha," III. 617.

Beer-sheba, the most southern town of Palestine, III. 504.

Samaria, XXI. 243.

Shechem, XXI. 783.

Nazareth, the town where Jesus lived, XVII. 302.

Gennesaret, otherwise called the Sea of Galilee, X. 29.

Gethsemane, sup. 1390.

Capernaum, V. 54.

Joppa, XIII. 746.

Antioch, II. 130.

Damascus, the oldest city in the world, VI. 790.

The journeyings of the Israelites from Egypt to the Promised Land may be traced by reading the following

references in their order: Starting from Rameses in Egypt, XX. 265, they fled to the Red Sea, XIII. 399. Here Pharaoh and his host were overthrown and drowned, but the Israelites, having crossed in safety, pursued their journey through the wilderness. For three days they had no water to drink, and arriving at last at Marah, XIV. 767, they found that the water in the springs there was bitter. This water was miraculously made sweet, and they continued their journey, finally reaching Sinai, XXII. 88, where the law was delivered to Moses. From Sinai they passed by various stations to Kadesh-Barnea, XXII. 821, and from that place sent out twelve spies to view the Promised Land. Being afraid to enter the Promised Land, they then turned back into the wilderness where they wandered for forty years. At Mount Hor, XII. 159, Aaron died. While passing around Edom, XII. 699, they were attacked by fiery serpents. Arriving at last on the plains of Moab, XVI. 533, the Israelite army was reviewed and the law was confirmed by Moses. Moses viewed the Promised Land from the top of Mount Pisgah and died there. After this the people under Joshua crossed the Jordan, XIII. 746, encamped a short time at Gilgal, X. 596, and then marched against Jericho, XIII. 629, and Ai, I. 424. At Shechem, XXI. 783, they again encamped, and there the cursings were read from Mount Ebal, X. 444, and the blessings from Mount Gerizim, XXI. 244. Returning to Gilgal, a treaty was made with the people of Gibeon, X. 583. At Merom, XIII. 746, the Northern Canaanites were signally defeated; and at Shiloh, XXI. 803, the twelve tribes were assigned to their respective possessions.

Journey from Egypt.

In much the same way we may follow the Apostle Paul in his voyage to Rome. He sets sail from Cæsarea, IV. 639; touches at Sidon, XXII. 35; thence proceeds to

Cyprus, VI. 747, and to Myra, XV. 93, where he is transhipped to a corn vessel which coasts along the shore of Asia Minor to Cnidus, V. 44. Being caught by the wind, the vessel is driven to Crete, VI. 569, and follows the southern coast of that island to Fair Haven, VI. 570. Sailing thence to find a secure harbor for the winter, the vessel encounters the wind Eurokylon, XV. 340, and sup. 1220; and, under shelter of the island Clauda, VI. 570, the sailors prepare for the storm by striking sail and turning the vessel's head to the wind. For fourteen days they are driven helpless across the sea, and are finally thrown upon the shore of Melita, XV. 840, escaping only with their lives. After three months, Paul sets sail in an Alexandrian corn ship, stops at Syracuse, XXII. 813, for three days; then, making circuit, passes Rhegium, XX. 341, and the next day lands at Puteoli, XVII, 188, where he rests a full week. Then he proceeds by the Appian Way, II. 211, to the city of Rome, XX. 807.

Paul's Voyage to Rome.

It is safe to say, in conclusion, that the earnest student of the Bible will find in the *Britannica* an answer to almost every question concerning biblical subjects that may be asked. From no other single work will he be able to obtain a larger amount of useful information at so little expenditure of time and labor. The *Britannica* is, in short, the great authority to which readers and students of every denomination or creed may turn with full confidence in its correctness and impartiality. See the chapter entitled *The Preacher and Theologian*, of this GUIDE.

CHAPTER XX.

READINGS IN MYTHOLOGY, LEGENDS, TRADITIONS, AND FOLK LORE.

"Books are our household gods."—*January Searle.*

"Gods and goddesses, all the whole synod of them!"—*Antony and Cleopatra.*

I. MYTHOLOGY.

MYTHOLOGY is the science which examines the myths of cosmogony and of gods and heroes. A very scholarly exposition of this science is given by Andrew Lang in Volume XVII., pp. 135–154, of the *Britannica.* Students, however, who are not already somewhat familiar with the subject will prefer to read some of the shorter articles first; they will afterward be able to take up this entertaining and comprehensive disquisition, and read it with appreciation and delight. The following list includes a number of interesting and valuable articles, arranged for the most part in alphabetical order:

Definition.

Myths of the creation, VI. 446, and XVII. 156. Read also the chapter on cosmogonies, I. 460.

Myths of the gods:

Apollo, II. 185.

Athena (Minerva), II. 830; XVI. 437.

Diana (Artemis), II. 643; VII. 167.

Hebe, XI. 490.

Hephæstus (Vulcan), XI. 679.

Juno, XIII. 778 (Hera), XI. 679.

Greek and Roman.



Jupiter, XIII. 779.
Mars, XV. 569, (Ares), II. 484.
Marsyas, XV. 575.
Mercury (Hermes), XI. 749; XVI. 530.
Nemesis, XVII. 331.
Neptune (Poseidon), XVII. 345; XIX. 558.
Saturn, XXI. 320.
Venus (Aphrodite), II. 171.
Vesta, XXIV. 193.
Zeus (Jupiter), XXIV. 782.

Northern.
The Aesir, I. 209.
Odin, II. 68; XVII. 156.
Frey, I. 210.
Balder, III. 275.
Niörd, I. 210.
Bragi, I. 211.
Thor, XVII. 156.
Freya, IX. 777.
Loki, XVII. 474.
Heimdal, I. 211, etc.
Asgard, II. 679.

Other Gods.
Bel, III. 175.
Ashtoreth, II. 735.
Astarte, II. 735.
Merodach, XXIII. 237.
Ammon, I. 740.
Anubis, II. 146.
Bubastis, IV. 408.
Baal, III. 175.
Moloch, XVI. 695.
Ahriman, I. 424.
Dagon, VI. 761.

Anoukis, II. 90.
Athor, III. 13.
Buto, IV. 590.

For further references, see the chapter entitled *The Preacher and Theologian*, in this GUIDE.

II. LEGENDS.

Old Greek Stories.

1. Closely allied to the myths of the gods—in fact, inseparable from them—are the legends of the ancient heroes. All are related in the *Britannica*, with now and then a pertinent inquiry respecting their origin, or a brief discussion concerning their interpretation. Here you may find the story of Achilles, whose "vengeful wrath brought woes numberless upon the Greeks," I. 94; of Acis and his love for the nymph Galatea, I. 98; of Actæon hunted by his own hounds, I. 129; of Adonis beloved by Venus, I. 163; of Adrastus and the war of the Seven against Thebes, I. 164; of Æacus, famed for his integrity and piety, I. 179; of Ægeus, the king of Athens, and of Ægina, the river-nymph, I. 180; of Ægis, the buckler of Jupiter, I. 181; of Ægisthus, the traitor, I. 181, and his betrayal of Agamemnon, "king of men," I. 273; of Æneas and his flight from Troy, I. 182; of Ajax Telamon and Ajax Oïleus and their bold exploits, I. 432; of fair Alcestis giving herself up to death to save the life of her husband, I. 459; of Alcinous and his Phæacian people, I. 468; of Alpheus, the river-god, I. 615, and his adventure with the nymph Arethusa, II. 485; of the Amazonian women, I. 655, brave warriors of the Colchian shore; of Amphiaraus, I. 749, whose prophetic power did not save him from an early death; of Amphion, I. 774, the sound of whose lyre caused stones to move and form themselves into the walls of Thebes; of Amymone and the satyr, I. 782.

This takes us only through the first volume. Of the numerous classical legends narrated in the remaining volumes, it is unnecessary to name all. Any course of reading on this subject, however, ought to include the following:

Other Classical Legends.

Anchises, the father of Æneas, II. 3.

Andromache, the wife of Trojan Hector, II. 22.

Andromeda, saved by Perseus from the jaws of a sea-monster, II. 22.

Antæus, giant and wrestler, overcome by Hercules, II. 100.

Antigone, the heroine of one of the most famous of the old Greek tragedies, II. 127.

The Argonauts and their famous voyage in search of the Golden Fleece, II. 497.

Ariadne, the fair maiden of Crete, II. 501.

Arion, the Greek bard and player on the cithara, II. 502.

Atalanta, the swift-footed huntress of Arcadia, II. 826.

Atreus, the father of Agamemnon, III. 50.

Atys, the beautiful shepherd of Phrygia, III. 65.

The autochthones, aborigines of Greece, III, 141.

Cadmus, the inventor of letters, IV. 629.

Calchas, the wisest of soothsayers, IV. 653.

Calliope, the Muse of epic poetry, IV. 709.

The centaurs, or "bull-killers," fabled as creatures half man and half horse, V. 340.

Cerberus, the three-headed dog that guards the gates of Hades, V. 345.

Cupid and Psyche, VI. 708.

The cyclopes, a lawless race of one-eyed monsters, VI 744.

Dædalus, the most famous artisan of prehistoric times, VI. 760.

Daphne, beloved by Apollo, VI. 821.

Danaë, the mother of Perseus, VI. 797.
Danaüs and his fifty daughters, VI. 797.
Deucalion, the Noah of the Greeks, VII. 134.
Dodona and its famous oaks, VII. 322.
Echo and her love for Narcissus, VII. 640.
Elysium, or the abode of the blessed, VIII. 156.
Endymion, and his perpetual sleep, VIII. 204.
The Epigoni, sons of the seven heroes who perished at Thebes, VIII. 477.
The Erinyes, or Furies, VIII. 524.
The Fauns, IX. 53.
Ganymede, the cup-bearer of Zeus, X. 72.
The Giants, X. 571.
Glaucus, the fisherman who became a god, X. 676.
The Gorgons, X. 784.
The Graces, XI. 26.
The Harpies, XI. 490.
Hercules, the greatest of the heroes, XI. 725.
Hero and Leander, XI. 754.
The Hesperides, daughters of the West, XI. 778.
Iphigenia, XIII. 211.
Jason, the leader of the Argonauts, XIII. 596.
Hyacinthus, the friend of Apollo, XII. 420.
Laocoön, the unfortunate Trojan, crushed by serpents, XIV. 292.
The Lapithæ, ancient race of Thessaly, XIV. 300.
Linus, who taught Hercules music, XIV. 678.
Medea, the enchantress, XV. 776.
Medusa, the Gorgon, X. 785.
Midas and the "golden touch," XVI. 278.
Milo, the wrestler, XVI. 323.
Minos and the Labyrinth of Crete, XVI. 478.
The Nymphs, XVIII. 688.
Nestor, oldest of Grecian heroes before Troy, XVII. 354.

Orpheus, the sweetest of all musicians, XVIII. 51.
Odysseus, or Ulysses, XVII. 729.
Pegasus, the winged horse of the Muses, XVIII. 468.
Pelias, king of Iolcos by the sea, XVIII. 474.
Phæthon, son of Helios, XVIII. 727.
Theseus, the great Athenian hero, XXIII. 294.
Romulus, the mythical founder of Rome, XX. 840.
The Trojan war, XXIII. 584.

2. Of old English legends intimately associated with much that is best in our literature, there are several with which every student should be familiar. Among these are the following:

English Legends.

King Arthur and his Knights of the Round Table, II. 649.
Lancelot of the Lake, XX. 644.
Merlin, the wizard, XX. 645.
Guy of Warwick, XI. 341.
Sir Bevis of Hampton, XX. 653.
Godiva, the fair lady of Coventry, VI. 530.
Fair Rosamond, XX. 848.
Whittington and his Cat, XXIV. 556.

3. Of Christian legends, some of the most interesting are:

Christian Legends.

Saint Cecilia, V. 284.
Saint Christopher, V. 704.
The Holy Grail, XI. 34.
Saint Nicholas, XVII. 482.
Saint Denis, VII. 79.
Saint Veronica, XXIV. 174.
Seven Sleepers of Ephesus, XXI. 697.

4. Of other famous legends the number is too great for anything like a complete list to be given. Among those

referred to or narrated in the *Britannica* the following may be mentioned :

Miscellaneous.

Adam's Peak in Ceylon, I. 140.
The Tower of Babel, III. 178.
The story of Lohengrin, XXIV. 314.
Roland, the great French hero, XX. 626.
The Cid, famous in Spanish story, V. 773.
Ogier, the Dane, XX. 652.
Prester John, King of Abyssinia, I. 65; XIX. 714.
The legend of Dr. Faustus, IX. 54.
Legends of Atlantis, III. 27.
William Tell, XXIII. 155.
The Beast Epic of Reineke Vos, VIII. 838.
The Pied Piper of Hamelin, XI. 409.
The Nibelungen Lied, XVII. 474.

The legends peculiar to different countries are also noticed in their appropriate places, as :

Legends of Afghanistan, I. 238.
Legends of Arabia, II. 255.
Legends of Central America, I. 703, etc.

5. *Fairy Stories.*—For special article, see VIII. 854. See also the following sections, paragraphs, and short articles :

Fairies, II. 203.
Brownies, II. 204.
Fairies in Celtic literature, V. 325.
Morgan, the Fay, V. 325.
Oberon, XVII. 704.

6. *Fables.*—See special article, VIII. 837.
Sanscrit fables, XXI. 287.
Æsop, the Greek fabulist, I. 212.
La Fontaine, the French writer of fables, XIV. 204.
Kriloff, the Russian collector of fables, XIV. 148.

CHAPTER XXI.

READINGS IN THE STUDY OF THE SUPERNATURAL.

"To make modern and familiar, things supernatural and causeless."
—*All's Well that Ends Well.*

Occult Sciences.

In this chapter it is proposed to point out to the reader a few of the most interesting articles in the *Britannica* relating to supernatural phenomena, the occult sciences, magic, mystery, superstition, etc. No attempt will be made towards a classification or logical arrangement of the subjects, nor is it possible to present anything approaching to a complete list of the articles and parts of articles which relate directly or indirectly to the supernatural. But it is believed that every student will find in these readings matter that will afford entertainment, and sometimes instruction.

Before the era of modern science, the belief in the supernatural held a much larger place in the estimation of mankind than it is possible for it to hold again. Alchemy, astrology, and magic reigned undisputed, and all knowledge of whatsoever kind was tinctured with superstition. Let us begin our readings, therefore, with selections from articles relating to these defunct sciences:

Alchemy.

1. Alchemy has been very aptly described as "the sickly but imaginative infancy through which modern chemistry had to pass before it attained its majority." See the very interesting article on this subject, I. 459–467. Read also the following articles and selections:

Paracelsus, XVIII. 234.
Jakob Böhme III. 852.
Hermes Trismegistus, XI. 750.
Alexander of Aphrodisias, I. 486.
Roger Bacon, III. 218; I. 186.
Albertus Magnus, I. 453.
Cornelius Agrippa, I. 418.
Raymond Lully, XV. 63.
Arnold of Villeneuve, II. 620.
The Rosicrucians, XX. 852.
Alembic, I. 477.

2. Astrology was the forerunner of the modern science of astronomy, and, like alchemy, was not altogether unproductive of good results. For a general history of this interesting subject, see the special article in volume II. 739–743. Also, consult the following short articles:

Astrology.

Horoscope, XV. 206.
Zodiac, XXIV. 791; VII. 550.
William Lilly, XIV. 642.
Nostradamus, XVII. 596.
Robert Fludd, IX. 349.
John Dee, VII. 22.
Michael Scott, XXI. 470.
Girolamo Cardan, V. 90; II. 742.
Napier's belief in Astrology, XVII. 183.
Astrology among the Parsees, XVIII. 325.

3. *Necromancy:* An important article on magic, its history and influence, may be found in XV. 199.

Magic.

Magic among Prehistoric Nations, VIII. 623.
Egyptian Magic, XV. 201.
Babylonian and Assyrian Magic, XV. 201.

Greek and Roman Magic, XV. 202.
Magic among Asiatic Nations, XV. 203.
The Rosicrucians, XX. 852.
Magic in Christendom, XV. 204.
Necromancy in England, VII. 22.

Superstitious Beliefs.

Divination, or the art of discovering secret or future things by preternatural means, VII. 293.
Augury, or the art of discovering through natural signs the will of the gods, III. 72.
Palmistry, the art of divining personal history from the lines in the palm of the hand, sup. 2285.
Ordeal, or the mediæval method of discovering the will of God, XVII. 820.
Dreams and their interpretation, VII. 452, 293.
Lycanthropy, or the metamorphosis of men into wolves, XV. 89.

Mysticism.

The mystical arrangement of letters, called Abracadabra, I. 52.
The mystical word Abraxas, I. 56.
The mystical ornament or charm, Amulet, I. 780.
The mystical science, Kabbalah, XIII. 810.

4. Demonology, or the influence of spiritual beings upon the affairs of men, VII. 60.
Sorcery, or familiar intercourse with demons, VII. 63.

Witchcraft.

Witchcraft, XXIV. 619. (A history of the laws and methods by which different nations have attempted to suppress this supposed crime.)
Exorcism, or the means by which evil spirits are expelled, VIII. 806.

Evil Spirits.

Devil, VII. 136.
Ahriman I. 424; XVII. 858; XXIII. 238.
Beelzebub, III. 503.

Asmodeus. II. 714.
Mephistopheles, XVI. 29.
Faust, the sorcerer of mediæval legend, XI. 54; X. 539.
Merlin, the wizard of Britain, XX. 645.
Apollonius of Tyana, philosopher and magician, II. 188.
Reginald Scot, English writer on witchcraft, XXI. 470.
Cotton Mather, the New England opponent of witchcraft, XV. 631.

5. The history of the belief in supernatural beings and in supernatural influences may be further illustrated by reference to the following articles:

Super-natural Influences.

Angels, II. 26; II. 183.
Azrael, sup, 305.
Raphael, XX. 274.
Gabriel, X. 30.
Michael, XVI. 226.
Apparitions, II. 202.
Astral Spirits, sup. 273.
Ghosts, II. 205; XV. 199.
Spiritualism, II. 207; XXII. 404; the Fox sisters, sup. 1322; Daniel D. Home, sup. 1601; Robert Dale Owen, sup. 2271.
Fetichism, II. 45.
Totemism, XXIII, 467.
Prophecy, XIX. 814.
Inspiration, XIII. 154; XIX. 197.
Second Sight, II. 202.
Hypnotism, II. 505.
Mesmerism, XV. 277.
Augury, III. 72.
Divination, VII. 293.
Bibliomancy, sup. 457.
Divination by Cup, sup. 965.

The Sibyllines, XXII. 13; XI. 144. See also Augurs, III. 72; Oracles, XVII. 808; XIX. 91.

Apotheosis, II. 199. See also Metempsychosis, XVI. 106.

Imaginary Beings.

6. The popular belief in imaginary creatures, as set forth in very many of the classical legends, in the romances of the Middle Ages, and in the fairy tales and folk-lore of almost every nation in the world, is the subject of numerous articles.

The following are especially noticeable:

Genii, sup. 1379.
Manes, XV. 477.
Penates, XVIII. 488.
Nymphs, XVII. 688.
Dryads, VII. 487.
Fauns, IX. 53.
Chimæra, V. 626.
Harpies, XI. 490.
Mermaids and mermen, XVI. 89.
Griffin, XI. 195.
Dragon, VII. 385.
Were wolves, XV. 89.
Fairies, VIII. 854.
Oberon and Titania, XVII. 704.
Morgana, V. 325.
Elves, VIII. 855.

See the references to astrology in *Readings in Astronomy*, in this GUIDE; also the references to alchemy in the chapter entitled *The Chemist.*

CHAPTER XXII.

THE DESULTORY READER'S COURSE.

"Read what amuses you and pleases you."– *Robert Lowe.*

"Adjust your proposed amount of reading to your time and inclination."—*Dr. Thomas Arnold.*

Reading for Pleasure.

To the person who takes pleasure (and who does not?) in browsing among the good things in books, without undertaking to read systematically, the *Encyclopædia Britannica* offers advantages which can be derived from no other publication. Here may be found all kinds of literary nuggets—readings on all manner of subjects—short articles, long articles—anything and everything to suit the demands of the hour. You need not attempt to follow any special course of reading—only read that which pleases you, and you may be sure that, whatever you may select from the *Britannica*, you cannot fail to be improved thereby. If your time is limited, choose something that is brief and light; if you are in a studious mood, take up a subject that will make you think, and that will be to your mind what brisk exercise is to your body. Among the thousands of articles with which you may thus occupy your spare moments, the following are mentioned merely as examples:

I. CURIOUS INVENTIONS, ETC.

Inventions.

The Automaton, III. 142.
The magic lantern (fully illustrated), XV. 211.
The guillotine, XI. 263.
Tunneling, XXIII. 622 (illustrated).
Wax figures, XXIV. 460.
Horn-books, XII. 170.

Perfumery, XVIII. 525.
Balloons, I. 187.
Fire engines, IX. 235.
Hydraulic Clock, V. 826.
Fire works, XX. 134.
Flying machines, I. 185.

2. NATURAL CURIOSITIES, SCENERY, ETC.

Nature.
The Luray cavern, XV. 67.
The Mammoth cave, XV. 448.
Niagara Falls, XVII. 472.
Whirlpools, XXIV. 540.
Whirlwinds and tornadoes, XVI. 129.
Geysers, X. 557.
Glaciers, X. 626.
Natural gas, sup. 2140.
Artesian Wells, sup. 250.
Giant's causeway, X. 572.
Tides, XXIII. 353.

III STRANGE ANIMALS AND PLANTS.

Prehistoric monsters, XII. 695.
The ichneumon, XII. 629.
The dodo, VII. 321.
The honey guide, XII. 139.
The sloth, XXII. 161.
Sea-serpents, XXI. 608.
Mermaids, XV. 89.
Dragons, VII. 385.
Chimæra, V. 626.
Harpies, XI. 490.
Trees.
Baobab Tree, I. 268.
Sacred Fig. IX. 154.
Upas Tree, XXIII. 859.
Orchids, XVII. 816.

IV. CURIOUS CUSTOMS, ETC.

Deodands, VII. 727.
Ordeal of Fire and of Battle, XVII. 820.
April Fool Day, II. 214.
Curious Customs. May Day in Old England, XV. 647.
The Morris Dance, XVI. 846.
Caste, V. 186.
Clans, V. 799.
Saturnalia, XXI. 321.
The Nile Festival, VII. 727.
Exorcism, VIII. 806.
Fehmic Court (a secret tribunal in Germany, twelfth to sixteenth century), IX. 63.
Pillory, XIX. 95.

V. DEATH AND BURIAL.

Funeral rites, IX. 824.
Burial, IV. 537.
Embalming, VIII, 158.
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Mausoleum, XI. 383.
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VI. HISTORY AND BIOGRAPHY.

History of Flags, IX. 276.
Guilds, XI. 259–262.
Historical. The Man of the Iron Mask, XIII. 360.
History of Newspapers, XVII. 42.
Piracy, XIX. 116.
Hypatia, XII. 596.

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Aspasia II. 714.
Field of the Cloth of Gold, II. 480.
The Spanish Armada, II. 543.
Great fires: in London, XIV. 826; in Chicago, V. 611; in Boston, IV. 75.
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VII. MISCELLANEOUS.

People and Things.

James Holman, the blind traveller, XII. 103.
Zerah Colburn, the mathematical prodigy, VI. 486.
Joseph Scaliger, "the greatest scholar of modern times," XXI. 362.
The Admirable Crichton, VI. 577.
Kaspar Hauser, the mysterious German youth, XI. 523.
Christian Heinrich Heinecken, the precocious child, XI. 628.
Dwarfs, VII. 567.
Siamese Twins, XVI. 765.
Heredity, I. 87.
Animal Magnetism, XV. 277.
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The Malthusian Doctrine, XV. 344.
Darwinism, XXIV. 77–85.
Cryptography, VI. 669.
White Magic (sleight of hand), XV. 207. See also Legerdemain, XIV. 414; Ventriloquism, sup. 3030.
Thugs, XXIII. 326.
Assassins, II. 722.
Story of the Tichborne Claimant, sup. 2909.

PART III.

THE BUSY WORLD.

CHAPTER XXIII.

THE MANUFACTURER.

"Active doer, noble liver,
Strong to labor, sure to conquer."

—*Robert Browning.*

FEW subjects engage the attention of so large a number of busy men as does that of manufacturing. Who, indeed, is not either directly or indirectly interested in the making of things, either by hand or by machinery? You may not be a manufacturer yourself, but you are necessarily the patron of many manufacturers. You are the consumer of the products of various manufacturing industries, and very naturally you have a curiosity to know something about the processes by which these products have been evolved from raw material and made into their present forms of usefulness. The *Encyclopædia Britannica* will give you the desired information.

Maker or Consumer.

If you are engaged in some particular line of manufacturing, the *Britannica* will add to your knowledge concerning it. It will tell you what are the best materials to be used, the most economical processes to be employed, and the most desirable qualities to be sought in the products which you design to manufacture. Besides this, it will probably give you a great deal of interesting historical information concerning the origin, development, and various fluctuations of the business in which you are engaged—information which, although not absolutely necessary to your success, may nevertheless add directly to your enjoyment and incidentally to your prosperity.

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This subject covers so wide a field and embraces so many different industries that, within our limited space, we can do but little more than make bare references to some of the most important articles contained in the *Britannica*. Let us first notice some of the manufactures of

TEXTILE PRODUCTS.

1. Wool and Woolen Manufactures is the title of a special article, XXIV. 653. The first part of this article, relating to the early history of the woolen industry, will interest every reader. See next the article on woolen manufactures in the United States, sup. 3188, where the very latest information and statistics are given. Now read what is said of

Wool.

Wool fibre, IX. 133.
Bleaching of wool, III. 822.
Dyeing of wool, VII. 571.
Cassimeres, sup. 718.
Spinning, XXIV. 730, XIV. 664.
Loom, XXIV. 64, XXIII. 206, 210.

Turn to the illustrated article on TEXTILES, XXIII. 206, and read the interesting history there given of the art of weaving.

2. For an account of flax and linen manufactures, see XIV. 663.

Flax.

The manufacture of linen in England, VIII. 232; in Ireland, II. 143, and XIII. 231; in Scotland, VII. 534.
Cultivation of flax in America, I. 64.
Bleaching of linen, III. 820.

3. For a complete history of cotton and cotton manufactures, see VI. 482.

Cotton in the United States, 824; in India, XII. 748; in Egypt, VII. 708, 786; in Brazil, IV. 227.

Cotton.

Cotton manufacture in England, VIII. 230; in India, XII. 761, 763; in Russia, XXI. 849.

Bleaching of cotton, III. 812.

Dyeing of cotton, VII. 576.

Cotton-spinning frame, II. 541.

Robert Owen's improvements in cotton spinning, XVIII. 87.

Cotton yarns, XXIV. 731.

The spinning-jenny, II. 541 and VI. 490.

The spinning-wheel, XXIV. 664.

Calico, VI. 488, 500.

Calico printing, IV, 684.

Ginghams, X. 604.

Gauze, X. 118.

Laces, XIV. 183.

See Samuel Slater, sup. 2728.

4. For a history of silk and silk manufactures, see XXII. 56, 61.

Manufacture of silk in the United States, sup. 2717; in England, VIII. 232; in India, XII. 761; in China, V. 638; in France, IX. 520; in Italy, XIII. 442.

Silk.

Silk in ancient times, XXIII. 208.

Bleaching of silk, III. 822.

The silkworm, IV. 596 and XIII. 151.

Silk from spiders, II. 295.

5. Miscellaneous.

Hosiery, XII. 299, and VIII. 233.

Knitting, XIV. 127.

Invention of the stocking frame, XII. 299.
Cloth, weaving of, XXIV. 463, 466.
Ancient weaving of cloth, XXIII. 206.
Improvements in looms, sup. 1915.
Carpets, V. 127; Persian carpets, XVIII. 626; Turkish II. 708; Oriental, XXIII. 211.
Canvas, V. 40; canvas for sails, XXI. 154.
Straw manufactures, XXII. 593.
Rope-making, XX, 844.
Twine manufacture, XX. 845.
Rhea fibre, XX. 506.

MINERAL PRODUCTS.

1. Iron manufactures, XIII. 278.
Statistics of iron manufacture, XIII. 358; iron industry in the United States, XXIII. 813; sup. 1694;
Iron. iron as building material, IV. 447.
Strength of iron, XXII. 603.
The Blast Furnace, IX. 840; III. 550; sup. 1695.
Melting-point of metals, sup. 2033.
Puddling, XIII. 320.
Pig iron, XIII. 306, 284.
Cast iron, XIII. 281, 318.
Manufacture of steel, XIII. 358; strength of steel, XXII. 603; rigidity of, VII. 815; manufacture in the United States, XXIII. 813; sup. 1700; use in ships, XVII. 288.
Bessemer steel, sup. 1701.
Steel castings, sup. 1704.
Nails, XVII. 165.
Screws, XX. 552.
Locks, XIV. 744.
Galvanized iron, XIII. 357.

Foundry operations, IX. 479.
The casting of metal, IX. 479.
Rolling-mills, XIII. 328.
Wire, XXIV. 614; wire-drawing, sup. 3175; strength of, XVI. 65; elasticity of, VII. 80, 803; telegraph wire, XXIII. 114; wire nails, XVII. 166; wire rope, XX. 846; wire netting, XVII. 360; wire fences, I. 310; wire-glass, sup. 3173.
Stoves, XXII. 579.
Iron pipes, II. 322.
Pipe-making, sup. 2393.

2. Copper, VI. 347; copper wire, XXIV. 615.
Brass (alloy of copper and zinc), IV. 217; zinc, XXIV. 784.

Copper and Tin.

Tin, XXIII. 400; strength of, XXII. 603.
Tin-plate, XIII. 357.
Can manufacture and canner's tools, sup. 684.
Tin-plate manufacture in the United States, sup. 2916.
Bronze (alloy of copper and tin), VI. 351.
Early casting of bronze, II. 348.
Strength of, XXII. 603.
Bronze work, XVI. 71.

3. Silver, XXII. 69.
Silver plate, XXII. 71.
Silver plate works, XIX. 178.
Silvering, XXII. 71.
Silver wire, XXIV. 615.

Precious Metals.

Use of silver in mirrors, XVI. 501.
Silver lace, X. 753.
Silversmiths in Rome, II. 366.
Gold, X. 740.
Gold plate, XIX. 178.

Gold wire, XXIV. 615.
Gold thread, XXIII. 209.
Gold lace X. 753; gold cloth, XXIII. 210.
Ancient workers in gold, XXIII. 210.
See now the chapter entitled *The Miner*, in this volume; also *The Railroad Man*, and *The Machinist*.

4. Pottery, XIX. 600; burning of, XX. 133; glazing, IV. 51.
Pottery Industry in the United States, sup. 2431.
Palissy's pottery, XVIII. 186.
Wedgwood's pottery, XXIV. 476.
Pottery. Japanese pottery, XIII. 590.
Indian pottery, XII. 763.
The potteries, sup. 1431.
Kaolin, XIV. I.
Porcelain, clay for, XIV. 1 and XVI 424.
Chinese porcelain, XIV. 90.
Japanese porcelain, XIII. 590.
Limoges ware, XIV. 651.
Sèvres ware, XIX. 637.

5. Glass, history of, X. 647.
Manufacture of glass, X. 650.
Manufacture of glass in the United States, sup. 1407.
Annealing, II. 63.
Colors of glass, XXIV. 427.
Glass. Painting on, X. 667.
Venetian glass works, XVII. 48.
Glass cutting, VII. 167.
Plate glass, X. 662.
Wire glass, sup. 3173.
Window glass, X. 660, 668.
Glass bottles, IV. 167, and X. 664.

Glass wire, sup. 1408.
Mirrors, XVI. 499.

6. Leather, XIV. 380.
Artificial leather, XIV. 391.
Latest processes, sup. 1849.
Shoemaking, XXI. 830.

7. Paper, XVIII. 217.
Papier-mâché, XVIII. 228.
Parchment, XVIII. 271.
Linoleum, XIV. 676.
Lincrusta Walton, XIV. 662.

8. Flour, sup. 1293; IX. 343; III. 251.
Bread, III. 250.
Cracknels, III. 252.
Macaroni, XV. 125.
The Canning Industry, sup. 703.
Raisins, sup. 3057.
Sugar, XXII. 622.
Food Products. Sugar-making machinery, sup. 2818.
Beet sugar, I. 382.
Glucose sugar, sup. 1412.
Maple sugar, sup. 1988.
Molasses, XXII. 626.
Salt, XXI. 228, XXIII. 817.
Animal foods, see Packing, sup. 2278, and Abattoirs, sup. 11.

9. Brick-making, IV. 280.
Ancient bricks, XIX. 604, 619.
Glazed brick, XVII. 35.
Tiles, XXIII. 387, IV. 283.

Miscellaneous.

Gutta-percha, XI. 337.
India-rubber, XII. 835, 839; Goodyear's inventions, sup. 1425.
Rope-making, sup. 2575.
Straw manufactures, XXII. 593.
Baskets, III. 421.
Needles, XVII. 313.
Pigments—methods of manufacturing paints, XIX. 85.
Hats, XI. 518; straw hats, XXII. 593.
Gloves, X. 692, XIV. 389.
Pins, XIX. 97.
Button-making, IV. 599.
American watches, sup. 3097.
Fans, IX. 27
Furniture, IX. 847.

Very interesting are the accounts that are given of some of the great manufacturing centres, such as:

Manufacturing Centres.

Manchester, the centre of the English cotton industry, XV. 459.
Birmingham, noted for its iron and steel works, III. 780.
Sheffield, famous for its cutlery, XXI. 785.
Philadelphia, and its extensive and varied industries, XVIII. 736.
Pittsburg, and its iron manufacturers, sup. 2396.
Lowell, and its cotton mills, sup. 1924.
Lynn, famous for the manufacture of shoes, sup. 1936.
Boston, IV. 72; Newark, XVII. 370; Wilmington, XXIV. 589; Birmingham, Alabama, III. 287; and scores of other manufacturing cities of similar importance.

For statistics and other information concerning manufactures in all the principal countries of the world, see

the appropriate paragraph under the name of each country. For example:

Statistics. Manufactures in England, VIII. 230.
Manufactures in Germany, X. 459.

Manufactures in Arabia, II. 245.

See World's Fairs, sup. 3209.

But the intelligent reader will require no further assistance from the GUIDE in finding such information.

CHAPTER XXIV.

THE MECHANIC.

"Thou art deeper read, and better skilled."—*Titus Andronicus.*

Artisan or Bungler?

WHAT constitutes the difference between the good artisan and the bungler? Knowledge and skill. These may be attained in some degree by practice in the handling of tools; but that broader knowledge which leads to success, and that more perfect skill which wins distinction, can be acquired only through diligent study. The mechanic who would rise to a higher position in his calling, must learn all about the nature of the materials with which he works; he must know what are the best tools to use, and why; he must understand the philosophy of the forces with which he deals; and he must seek to comprehend the natural laws which govern or regulate the operations connected with his particular handicraft. This is the kind of knowledge which enables the humblest workman to develop into the foreman, the manager, the inventor, the skilled artisan.

Now there is no other printed publication in the world which offers the means of acquiring so much of this kind of knowledge as does the *Encyclopædia Britannica.* There is hardly a single difficult problem connected with the laws of mechanics or of machinery which is not clearly explained in the *Britannica.* There is hardly a knotty

question with reference to tools, materials, or products which is not elucidated or answered in one of these volumes. The successful mechanic will not always wait for these difficulties to present themselves. He will study the principles of his trade and every detail concerning it, so as to be ready beforehand for all emergencies. Instead of running with childish questions to his foreman, he is ready himself to give instructions to those who are in need of them. His workmanship is of superior character. He is constantly improving, while his fellows who work without thought remain always on the same level. His greater knowledge leads to greater ability. His employer recognizes the greater value of his services. Promotion comes to him as a matter of course. Success and fortune are waiting for him—and all because he has made use of the opportunities for self-culture which lie within the reach of every one who will take the trouble to secure them.

Mechanic's Helper.

In these days there are so many kinds of handicrafts and so many classes of mechanics, that to mark out complete courses of study with relation to all would require more space than we have at command. But the *Encyclopædia Britannica* contains a vast amount of valuable information concerning every one of them; and it is the object of the GUIDE to help you to get at some of this information in a methodical way, and thereby make you the better able to carry on these studies independently and without aid.

Your first thought, no doubt, will be to turn at once to the article MECHANICS, XV. 676; but it will be better to leave this article until we have made a study of some of the materials and tools with which you propose to work. In this way we shall gradually approach the difficult *science* of mechanics, and by and by we shall be prepared

to read portions of this exhaustive article with a more thorough appreciation than is now possible.

THE WOOD-WORKER.

Are you a worker in wood? Here are a few articles, or parts of articles, which you will read with pleasure and profit.

Wood Work.

Lumber, IX. 404.
Strength of materials, XXII. 594, sup. 2799.
Bending of plank, XV. 744.
Carpentry, IV. 476.
Sawing of wood, XXI 345.
Joinery, IV. 485.
Fir, IX. 222.
Teak, XXIII. 103.
Hemlock, II. 320.
Spruce, XI. 222.
Oak, XVII. 689.
Pine XIX. 102.
Poplar, XIX. 510.
Rosewood, XX. 851.
Mahogany, XV. 288.

Tools.

The early use of tools, VIII. 617.
The plane, XI. 437.
The auger, XI. 438.
Other hand tools, XI. 437.
Machine tools, XV. 152.
Turners' tools, XIV. 324.
The hammer, XI. 425.
The lathe, XIV. 323.
Glue, X. 133, and IV. 489.
Veneering, XXIV. 138, and IX. 489.
Varnish, XXIV. 91.
Barrel-making, sup. 361.

Wood-carving, XXIV. 644, and V. 168.

These are mentioned here simply as samples of the numerous articles wherein the wood-working mechanic will find practical information concerning the materials, tools, etc., of his handicraft. If you are a carpenter or builder, turn now to the chapter in this volume entitled *The Builder*, and observe the long and valuable list of references there given.

THE METAL-WORKER.

Metal Work.

The metal-worker will find that most of the above references are of direct importance to him also, and he will scarcely be willing to omit any of them from his course of reading. Besides these there are numerous others which he will regard as having a special value, referring, as they do, directly to the handicraft in which he is the most deeply interested. Here are a few of them:

Anvil, II. 147; XI. 426.

Smith-work in building, IV. 510.

Annealing, II. 63, and XIII. 352.

Forge, IX. 412; its history, XIII. 290; forging-machines, IX. 413.

Foundry, IX. 479; XIII. 355.

Bellows for smelting ores, XVI. 60.

Blast furnace, IX. 840; III. 550: sup. 1695.

Iron, XIII. 278.

Iron as building material, IV. 447.

Iron-work in architecture, II. 466; XVI. 71.

Famous iron-works: at Barrow-in-Furness, England, III. 395; at Stafford, England, XXII. 442; at Neviansk, Russia, XVII. 369.

Iron bridges, IV. 334.

Nail-making, XVII. 165.

Tack-making, sup. 2845.
Steel, XIII. 278.
Tube-making, IV. 218.
Valves, XXII. 501.
Wire-making, sup. 2173.
Wire, XXIV. 614; wire-drawing, IV. 217.
Arms, II. 588; artillery, II. 655; rifles, XI. 282; rifling of cannon, XI. 294. (See chapter in this GUIDE entitled *The Soldier*.)
Assaying, II. 724; XVI. 63.
Boilers for steam engines, XXII. 496; improvement in, for abating smoke, XXII. 181.
Brass, IV. 217.
Bronze, IV. 366.
Copper, VI. 347. (See chapter in this GUIDE entitled *The Miner*.)
Electro-plating, VIII. 116. (See chapter in this GUIDE entitled *The Electrician*.)
Metallurgy, XVI. 57.
Metal work, XVI. 71.
Tin-plate manufacture in the United States, sup. 2916.

THE LEATHER-WORKER.

Work in Leather.

There are mechanics who work neither in wood nor in metal. Of these, one of the most prominent is the man who works with leather or with the prepared skins of animals. For him there are, in the *Britannica*, such articles as the following:

Tanning, XIV. 381.
Tannin, XXIII. 47.
Leather, XIV. 380.
Buff leather, sup. 610.
Cordovan leather, sup. 917.
Artificial leather, XIV. 391.

New processes in making leather, sup. 980.
Shoemaking, XXI. 830.
Harness-making and saddlery, XXI. 142.
Stamped leather for wall decoration, XVII. 37.
Morocco leather, XIV. 388.
Book-binding, IV. 41; XIV. 538.

THE PAPER-WORKER.

Then there is the worker on paper, who will find the following articles brimful of information:

Paper, XVIII. 217; manufacture of, XVIII. 219; bleaching of materials, III. 821.
Ruling of paper, XXII. 461.
Paper. Wall paper, IV. 512; XVII. 38.
Papier-mâché, XVIII. 228.
Paper pulp, sup. XVIII. 225, 226.
See the chapter in this volume entitled *The Laborer*.

THE STONE-WORKER.

Building-stone, sup. 614; IV. 448.
Stone cutting and dressing, sup. 2794.
Strength of building-stone, XXII. 603.
Plaster-work, IV. 504.
Cements, V. 328; IV. 459; XIV. 647.
Stone pavements, IV. 473.
Chimney-pieces, IV. 473.
Limestone, X. 232.
Marble, XV. 528.
Marble veneer, XVII. 36.
Sandstone, X. 237.
Granite, XI. 48.
See the references to labor and wages in the chapter entitled *The Political Economist*, in this volume.

CHAPTER. XXV.

THE MACHINIST.

"He that loves reading has everything within his reach."—*William Godwin.*

IN addition to the articles already mentioned in the chapter addressed to the Mechanic, the practical machinist will find a great many others which will be of direct and special aid to him in his calling. He will want to make a careful study of that portion of the article MECHANICS which refers directly to the theory of machines, XV. 752. He will want to read what is said about their purposes and effects, XV. 771. There may be other portions also of the same article which will answer troublesome questions or difficult problems that come in his way, and to find what he needs he should refer to the index to the article, XV. 749. The article on Machine Tools, XV. 152, will have a special value to him. The supplementary article on special forms of machine tools, sup. 1951, gives an exceedingly interesting description of some of the latest inventions of this class. See, also, Tool-making, sup. 2927.

Machines.

THE STEAM ENGINE, XXII. 473—a very complete and comprehensive treatise (fifty-four pages, illustrated) written by Professor Ewing of Dundee, one of the most eminent of living authorities. Additional matter concerning the invention of the steam engine by Watts may be found in XXIV. 412. The improvements made by Murdock are briefly noted in

Steam Engine.

XVII. 53, and those of Trevithick, in XXIII. 554. See also Governors, sup. 1433.

Various applications of the steam engine are described: Its use in steamships, XXII. 517, and XXI. 823; its use in locomotive engines, XX. 205, 244, and XXII. 537; its use in land carriages, VIII. 726; its application to farm machinery, I. 305, etc.

Hydro-mechanics.

The article HYDROMECHANICS, XII. 435; the application of water to mechanical purposes, as described in the chapters on Hydraulic Machinery, XII. 519, and sup. 1641. The hydraulic press, XV. 753, and the history of its invention, IV. 213. The article on Calender, IV. 683.

The description of Montgolfier's hydraulic ram, IV. 173.

The description of the hydraulic elevator (lift), XII. 520, and XIV. 574.

Of water motors in general, XII. 519.

Of water power in mechanics, XV. 773.

Of water wheels and their action, XII. 438, 522.

Late improvements in water wheels, sup. 3104.

Pneumatics.

Of the uses of air in connection with mechanics, read the article PNEUMATICS, XIX. 240; refer also to XII. 439, 445.

Its special application in air locks is noticed in sup. 104; in the air washer for extinguishing fires, IX. 681; in the pneumatic power transmitter, XV. 753; in pneumatic tubes, XII. 491; in the air engine, I. 428; in the air gun, I. 428; in the air pump, XVI. 30; XIX. 246; I. 429.

As to the application of air in propelling machinery, see Windmills, XXIV. 599; XV. 773.

Wind carriages, XXII. 545.

See also what is said about the wind in navigation, XVII. 275. In this connection it will be interesting to learn many important facts concerning the nature of air: Its composition, III. 32; its density, III. 381; its weight, III. 28; its other physical properties, XIX. 240.

Here, too, you may read of the efforts that have been made to navigate the air, I. 187, with a description of all the great balloons that have ever been constructed. Whether it is possible ever to build a successful air ship no one can yet predict. The problem of aëronautics has, however, engaged the attention of inventors for many years, and the history of their efforts and experiments is in the highest degree interesting and instructive. Read of the invention of the balloon by Stephen and Joseph Montgolfier, I. 187; of the later experiments by Langley, Maxim, Chanute, Lilienthal, and others, sup. 55; and of the aëronautic associations which have been formed for the encouragement of further experiments and inventions.

Balloons.

But air is only a gas—or rather the combination of two gases, I. 427—and much that is true with reference to its properties applies also to gases in general. And so the machinist who finds it necessary to become acquainted with the laws of pneumatics will not only study the properties of air in motion and at rest, but will learn all that he can about gases in general, VI. 310, their physical properties, XIX. 240, and their diffusion, VII. 215.

Of the application of gas to the purposes of machinery, see what is said about gas engines, XXII. 523; expansion of gases by heat, XI. 574, and XX. 347; elasticity of gases, VII. 801; dilation of gases, III. 35; their molecular laws, XVI. 611.

Gas.

Then read about the discovery and use of natural gas in the United States, XXIII. 813, and sup. 2140.

For a list of references relating to applications of electricity, see the chapter in this volume entitled *The Electrician.*

The meaning of the term horse power, and its application in practical mechanics, is explained in XV. 772, 773; and it is still further noticed in XII. 207, and XV. 715. The signification of the term when used in connection with steam engines is made clear in XXII. 476, 491.

Horse Power.

There are still other forces which influence the action of machinery, and of whose manifestations and laws the machinist cannot afford to be ignorant. There is GRAVITATION, for example, the influence of which must always be considered when any system of machinery is contemplated. Study the article on this subject, XI. 66.

Laws of Mechanics.

Then read of the discovery of the general law of gravitation, II. 755; of the various theories in relation to it, III. 64; of gravity in mechanics, XV. 701, 729; and of the discoveries of Archimedes concerning the centre of gravity, II. 380.

Still pursuing this line of study, read of the laws and effects of adhesion, I. 153; of cohesion, V. 56; and of elasticity, VII. 796.

The laws of friction must now claim your attention, and these you will find very fully treated in IX. 777, and XV. 702, 765. The action of friction in connection with liquids is described in XII. 482, and with gases in XVI. 618.

The expenditure of energy in the overcoming of friction is explained in VIII. 208, and the influence of lubricants in preventing friction receives attention in XV. 35.

For an elaborate and very practical essay on strength of materials, see sup. 2799–2811.

You are now ready for the article on DYNAMICS, or the science which treats of the action of force; and after that for the article on Energy, or the power of doing work, VIII. 205. Then read the following:

Dynamics.

Force, VII. 581
Motion, XV. 676, 752.
Momentum, XV. 677.
Velocity, XV. 681, 769.
Inertia, XV. 676, 748.
Laws of Projectiles, XXII. 47.

If you have followed this course of reading faithfully, you have acquired a comprehensive knowledge of those fundamental principles of mechanics which govern the action and modify the effectiveness of all machinery. Much of the reading has been difficult: it has required hard study to master it all. But now you will understand what is meant when it is said that it is the well-informed mind no less than the skilful hand that makes the successful mechanic. Knowledge never impairs one's ability to work, but it adds to that ability. Of course, knowledge cannot supply the place of energy and strength. A good mind must be aided by strong arms; a full memory must have the support of steady industry, or no worthy success can be attained. The best artisan is he who possesses a thorough knowledge of the foundation principles of his calling, while at the same time he has the trained hand and eye and the obedient muscle which can result only from long and patient training and experience.

See now, for further references, the following chapters in this GUIDE:

The Architect, The Builder, The Manufacturer, The Electrician, The Inventor, and Two Courses of Reading in Physics.

CHAPTER XXVI.

THE ELECTRICIAN.

"Every person has two educations, one which he receives from others, and one, more important, which he gives to himself."—*Gibbon.*

PRACTICAL electricians will find in the supplementary article on Electricity, sup. 1133–1173, a very comprehensive presentation of the entire subject as it is now understood. This article, which comprises forty pages, is very fully illustrated, and gives a complete outline of all the latest discoveries. It is invaluable to all persons who are in any way interested in this subject.

Special Article.

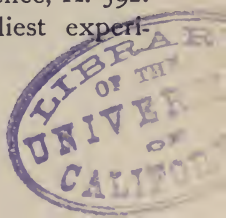
The leading article on electricity, in the eighth volume of the *Britannica*, comprises over one hundred pages—equal in amount of matter to an ordinary 12mo volume of nearly five hundred pages. For the sake of non-scientific readers it is introduced by a brief history of the science, wherein mention is made of some of the more striking electrical discoveries, and of the steps by which our knowledge of the subject has advanced to its present condition.

FAMOUS ELECTRICIANS.

In connection with the above-named articles, the following notices of men who have contributed to the advancement of the science will be read with interest:

Dr. Gilbert (1540–1603), founder of the science, X. 592.

Robert Boyle (1627–91), one of the earliest experimenters.


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Historical.

Otto von Guericke (1602–80), XI. 245.
Sir Isaac Newton (1643–1727), XVII. 438.
Francis Hawksbee (1705), VIII. 4.
Galvani, discoverer of galvanism, X. 48.
Benjamin Franklin (1706–90), IX. 711.
Henry Cavendish (1731–1810), V. 271.
Coulomb (1736–1806), VI. 509.
Volta inventor of the voltaic battery, XXIV. 284.
Ampère, I. 748.
Ohm, XVII. 738.
Michael Faraday, IX. 29.
Cyrus W. Field, sup. 1264.
Nikola Tesla, sup. 2882.
Thomas A. Edison, sup. 1115.

SPECIAL SUBJECTS IN ELECTRICITY.

Reference List.

Accumulators, I. 92.
Armatures, sup. 235; armature drum, sup. 1158.
Batteries: History of VIII. 92, 94; Bichromate, sup. 1170; Bunsen's, sup. 1169; copper oxide, sup. 1170; Daniel's sup. 1169; Grove's, sup. 1169; Leclanché's, sup. 1170; silver chloride, sup. 1170; Voltaic, sup. 1168.
Circuit, Magnetic, sup. 1151.
Condensers, sup. 1143.
Conductors and non-conductors, sup. 1134, 1140, 1146.
Currents, sup. 1144, 1159.
Diagometer, sup. 1039.
Dynamo electric machines, sup. 1156.
Dynamos, sup. 1159.
Electric light in microscopy, sup. 2057.
Electric meters, VIII. 107, 108.
Electrification, sup. 1135.
Electrodynamic action, VIII. 10, 66, 105.

Electrolysis, or the decomposition of chemical substances by the agency of the electrical current, is dealt with in a comprehensive and scientific manner in VIII. 106–114.

A supplementary article on the same subject (see sup. 1174–1176) gives an interesting account of the latest discoveries and investigations in this branch of science.

Electromagnets, VIII. 66; sup. 1147, 1150.
Electrometallurgy, VIII. 114.
Electrometer, VIII. 117–122.
Electromotive force, sup. 1145.
Electromotograph, sup. 1176.
Electrophorus, VIII. 101; sup. 1136.
Electroscopes, VIII. 118; diagometer, sup. 1039.
Fan-motor, sup. 1243.
Field-magnets, sup. 1158.
Fluoroscope, sup. 1295.
Galvanism, X. 48; XVII. 524.
Galvanometers, X. 49; VIII. 41; sup. 1147.
Induction, Electromagnetic, sup. 1152.
Induction-coils, sup. 1154.
Influence-machines, sup. 1137.
Insulators, sup. 1134.
Intensity, sup. 1139.
Magnetism, XV. 219; sup. 1151; I. 749.
Ohm's law, VIII. 41–43.
Poles of electromagnet, sup. 1162.
Potential, sup. 1141.
Resonance, sup. 1162.
Thermoëlectric generator, sup. 1378.
Röntgen Rays, sup. 1166, 2574.
Transformers, sup. 1155.
Volts and Ampères, sup. 1160.
Voltmeter, sup. 3061.

ELECTRICAL APPLIANCES AND MACHINERY.

Telegraph, XXIII. 112.

Invention of the telegraph, see Guillaume Amontous, I. 746; S. F. B. Morse, XVI. 847; Sir Charles Wheatstone, XXIV. 537.

Telegraphic devices, sup. 2866.

The pantelegraph, sup. 2289.

The Telegraph.

The phonophore, sup. 2369.

Ocean cables and submarine telegraphy, XXII. 281, and sup. 1264.

Telegraphs in the United States, sup. 2867.

Telegraphic statistics, sup. 2868.

Telantograph, sup. 2866; writing telegraph, sup. 3208.

The telephone, XXIII. 127.

Long-distance telephones, sup. 2869.

Alexander Graham Bell, sup. 408.

Thomas A. Edison, sup. 1115.

Telephonic apparatus, sup. 2870.

Theatrophone, sup. 2888.

Electric motors, XXIII. 496, 508.

Electric Motors.

Latest improvements in electric motors, sup. 2115.

Electric railways, XX. 249, sup. 2505.

Trolley systems for electric motors, sup. 2116, and XXIII. 494.

Trolley railways, sup. 2945.

Electric car construction, sup. 695.

Storage batteries, sup. 1171.

Tesla's oscillator, sup. 2264.

Lightning arresters, sup. 1886.

Niagara power plant, sup. 2207.

Electric elevators, sup. 1177.

Electric police and fire-alarm systems, sup. 1272.

Electric clocks, VI. 25; sup. 836.
Electric alarm thermometer, sup. 109.
Electric piano, sup. 2380.
Electric regulator, sup. 2529.
Electric lighting, XIV. 630.
The fluorescent lamp, sup. 1295.
Electric welding, sup. 3118.
Phonograph. Phonograph, sup. 2368; XXIII. 130, 134.
Kineto-phonograph, sup. 1790.
Gramophone, sup. 1437.

Kinetoscope, sup. 1790.
Vitascope, sup. 3057.
See the chapter, in this GUIDE, entitled *The Inventor*.

MAGNETISM.

Magnetism, XV. 219; sup. 1151; I. 749.
Terrestrial magnetism, XVI. 159.
The Compass, etc. The compass, VI. 225.
The dipping-needle, sup. 1051.
Variation of magnetic needle, XV. 220.
Relation of magnetism to electricity, I. 749.
Electromagnets, VIII. 66; sup. 1147, 1150.
Field-magnets, sup. 1158.
Magnetic iron ore, XIII. 287.
Animal magnetism, XV. 277.

ELECTRICAL PHENOMENA.

Lightning, XXIII. 330.
Franklin's experiment with a kite, VIII. 6; Lightning conductor, XIV. 633.
The cause of thunder, I. 107.
Natural laws regulating the frequency of thunderstorms, XVI. 128.

Aurora Borealis, or Northern Lights, III. 90.
Connection of lightning with the Aurora, III. 92.
Sun-spots and magnetic disturbances, II. 787.
Easy experiments to illustrate electrical laws, VIII. 16.
Animal electricity, sup. 188.

CHAPTER XXVII.

THE INVENTOR.

"Neither the naked hand nor the understanding, left to itself, can do much; the work is accomplished by instruments and helps, of which the need is not less for the understanding than the hand."—*Bacon.*

THERE are few persons who have more to gain from self-culture than those who aspire to success as inventors. It is true that now and then some wonderful discovery has been stumbled upon by accident. But almost every invention that has been of any genuine importance to the world has been the result of long and patient study and unwearying toil. No amount of guesswork will produce a new machine possessing the qualities of novelty and utility requisite to a successful invention. The man who would bring such a machine into existence must devote his days to the acquisition of a thorough knowledge of the philosophical principles underlying its construction. He will need to understand the laws of mechanics; he must be able to perform certain necessary mathematical processes; and he must have an insight into the theory of machinery. One inventor will probably find it necessary to study the laws of hydrostatics; another will need to have a complete knowledge of chemistry, or of mineralogy, or of botany; still another will add to all these branches of knowledge an understanding of the science of optics, or or acoustics, or it may be of meteorology, or of astronomy, or of navigation.

Knowledge *vs.* Guesswork.

PATENTS.

Then, again, every inventor will find it worth while to learn what has been done by other inventors who have come before him. Turn to the chronological table on page 720, Volume V., of the *Encyclopædia Britannica*, and notice the dates when the great inventions and discoveries which have revolutionized the world first made their appearance. Read next the HISTORY OF PATENTS in XVIII. 354–358, and notice the patent laws which are now in force in all the principal countries, and particularly in the United States, sup. 2309.

Patents.

List of models in the U. S. Patent Office, sup. 2311.
Business of the Patent Office, 1837–1896, sup. 2313.
New organization of the Patent Office, sup. 2315.
How to apply for a patent, sup. 2317.
Fees for patents, sup. 2320.
Trade-marks, sup. 2321, XXIII. 499.
Registration of prints, etc., sup. 2322.
Forgery, IX. 414.

GREAT INVENTORS.

It will now be both profitable and interesting to read the biographies of the famous inventors of various times and countries. You might begin with the legendary story of Dædalus, the first great inventor, VII. 760; then take up subjects like the following:

Roger Bacon, the first English scientist and inventor, III. 218; his magical inventions, XV. 208; his theory of optical glasses, XXIII. 135.

Sir Humphry Davy, inventor of the safety lamp, VI. 845; the Davy lamp, VI. 72.

Denis Papin, inventor of the heat engine, XVIII. 228,

and XXII. 474; his improvements on the air pump, XIX. 246.

James Watt, inventor of the steam engine, XXIV. 412.

Robert Fulton, inventor of the steamboat, III. 542.

Oliver Evans, improver of the steam engine, VIII. 726, and XXII. 475.

Benjamin Franklin, the first American scientist, IX. 711; his electrical researches, VIII. 6.

Eli Whitney, inventor of the cotton gin, XXIV. 1627; sup. 3145.

Samuel F. B. Morse, inventor of the telegraph, XVI. 847.

David Edward Hughes, inventor of the printing-telegraph, sup. 1629.

Sir Richard Arkwright, inventor of the spinning-frame, II. 540; VI. 490.

James Hargreaves, inventor of the spinning-jenny, VI. 490; XVII. 600.

Charles Goodyear, inventor of vulcanized india-rubber, sup. 1425.

Robert Hare, inventor of the oxy-hydrogen blowpipe, sup. 1526.

Samuel Crompton, inventor of the spinning-mule, IV. 597.

Samuel Colt, inventor of improved firearms, VI. 166.

Richard J. Gatling, inventor of the Gatling gun, sup. 739.

Henri de Girard, inventor of flax-spinning apparatus, X. 620.

Sir William Siemens, inventor of the gas engine, XXII. 37, 526.

Elias Howe, inventor of the sewing-machine, XXI. 718; sup. 1623.

Alvan Clark, telescope-maker, sup. 817.

Cyrus H. McCormick, inventor of the reaping-machine, sup. 1945.

Thomas A. Edison, inventor of many electrical machines and appliances, sup. 1115.

Alexander Graham Bell, inventor of the speaking-telephone, sup. 408.

Isaac Babbitt, inventor of Babbitt metal, sup. 307.

Henry Bessemer, "Bessemer steel," sup. 437.

John Ericsson, inventor of the Monitor, sup. 1212.

Oliver Evans, inventor of the steam road-carriage, sup. 1222.

M. W. Baldwin, inventor of locomotives, sup. 325.

Thaddeus Fairbanks, inventor of platform scales, sup. 1237.

FAMOUS INVENTIONS.

Gunpowder, II. 655; XI. 316; VIII. 807; first use of gunpowder, II. 655.

Firearms, history of, II. 655; ancient guns, II. 557; gun-making, XI. 278; gunnery, XI. 297; rifle, XI. 282; musket, II. 558; naval cannon, XVII. 286.

Printing-presses, sup. 1271; type-setting machines, sup. 1272; XXIII. 700; typewriters, sup. 1516; XXIV. 698.

Air ships. See the article Aëronautics, I. 185, and particularly the supplementary article on the same subject, sup. 55, which gives an account of the latest experiments and discoveries. Read of flying-machines in the article Flight, IX. 317; and of balloons in III. 549, and I. 187.

Air compressors, sup. 104.

Air engines, I. 428.

Anemometer, sup. 184.

Bells, sup. 412.

Brakes, IV. 211; railway brake, XX. 248; sup. 547.

Buttons, IV. 598.

Brushes and brooms, IV. 403.

Calico-printing machines, IV. 685.

Calculating-machines, sup. 651.
Candle-making, history of, IV. 802.
Carriages, history of, V. 134.
Clocks, VI. 13; electrical clocks, VI. 25.
Coloring-machines, IV. 691.
Compressed air for driving machinery, sup. 104.
Combs, VI. 177.
Cutlery, VI. 733.
Diving-bells, VII. 294–300.
The eidoloscope, sup. 1127.
Elevators (lifts), XIV. 573; sup. 1177.
Ferris wheel, sup. 1261.
Fire-extinguishing apparatus, IX. 235, and sup. 1273.
Friction matches, invention and history of, XV. 624.
Furniture, IX. 847.
Gramophone, sup. 1437.
Horseless wagons, sup. 296.
Kinetograph, sup. 1790.
Kineto-phonograph, and kinetoscope, sup. 1790.
Locks, XIV. 744.
Lithography, XIV. 697.
Photo-lithography, XVIII. 833.
Microscope, invention of, XVI. 258.
Milling-machine, sup. 2067.
Mortising-machine, sup. 2113.
Mirrors, XVI. 499; magic mirrors, XVI. 501.
Pens, XVIII. 483.
Pencils, XVIII. 489.
Phonograph, invention of, XXIII. 130, 134.
Photography, XVIII. 821; Daguerre's invention of, VI. 761; Niepce's inventions, XVII. 495; electric-flash process, VIII. 636.
Photogravures, invention of process, sup. 1235.
Pneumatic-delivery systems, sup. 104.

Reaping-machines, I. 322.
Rings, history of, XX. 560.
Rope-making, XX. 843.
Sewing-machines, XXI. 718.
Slot machines, sup. 2730.
Safety lamp, VI. 487 ; VI. 72, and XVI. 461.
Spectacles, XXII. 372, and XVI. 258.
Steam engine, invention of, XXIV. 412 ; description of, XXII. 473.
Steamships, invention of, III. 542 ; IX. 270, and XXII. 478 ; description of, XXI. 823.
Stereoscopes, XXII. 537.
Stocking-frame, XII. 299.
Telegraph, history of, XXIII. 112.
Telephone, history of, XXIII. 127 ; description of, 130.
Telescope, history of, XXIII. 135–139 ; description of, 139–154.
Twine-making, XX. 845.
Vitascope, sup. 3057.
Watch-making, XXIV. 394.
Water-tube boilers, sup. 509.
Water meter, sup. 3101.
Weaving, XXIV. 463 ; ancient looms, XXIII. 206 ; spinning-jenny, II. 541, and VI. 490.
Weighing-machines, sup. 3116.

This list might be continued to a very great length, but enough has been given to indicate the very complete and comprehensive manner in which the subject of inventions is treated in the *Britannica*.

SPECIAL SUBJECTS.

Now, there are certain special subjects with which almost every inventor needs to have some acquaintance. One man will want to know all about the most recent dis-

coveries in electricity; for he is seeking to invent some new electrical appliance, or to make some improvement on former patents. He should consult the references mentioned in the chapter entitled *The Electrician*, in this GUIDE. Another inventor will find it necessary to investigate the phenomena and laws of HEAT. Here are some references that may be helpful to him:

Heat.

Special article on Heat, XI. 554.
Theory of the action of heat, XIX. 2.
Heat as energy, VIII. 207.
Latent law of heat, VIII. 731.
Diffusion of heat, VII. 207.
Conduction of heat, XX. 212.
Convection of heat, XX. 212.
Power of heat in mechanics, XV. 773.
Production of heat by different fuels, IX. 807.
Heat of coal compared with that of oil, XVIII. 240.
Mechanical equivalent of heat, VIII. 209.
Transformation of heat into force, XXIII. 283.

Mechanical Laws.

A third inventor will want to understand the theory and construction of MACHINES, and perhaps also the general laws of mechanics. Let such an one consult the references named in the chapter entitled *The Mechanic*, in this GUIDE. A fourth inventor is interested in such subjects as the air, gases, etc. He will find the *Britannica* full of information of just the sort that he is seeking. For example, in I. 427, there is a brief article on air, with references to

Atmosphere, III. 28.
Meteorology, XVI. 114.
Barometer, III. 381.
Pneumatics, XIX. 240.
Ventilation, XXIV. 157.

This is followed by an interesting account of the air

engine, I. 428, and this by an article describing the air pump, I. 429. Then, by turning to the Index volume, one may find scores of minor references to various items of information relating to this particular subject.

In short, there is no subject connected with the invention of machines, or of useful appliances of any kind, that does not receive somewhere in the *Britannica* the concise and comprehensive treatment which its importance demands.

See the following chapters in this book: *The Engineer*, *The Architect*, *The Builder*, *The Manufacturer*, *The Railroad Man*, *The Farmer*, *The Printer*, *The Miner*.

CHAPTER XXVIII.

THE ARCHITECT.

" . . . When we mean to build
We first survey the plot, then draw the model."

—*2 Henry IV.*

"If a man read little, he had need to have much cunning to seem to know that he doth not."—*Lord Bacon.*

THE work of the architect is closely connected with that of the builder. The end of building, merely as such, is convenience or use, irrespective of appearance; but the end of architecture is so to arrange the plan, masses, and enrichments of a structure as to impart to it interest, beauty, grandeur, unity, power. Building is a trade; architecture is an art.

Definitions.

The *Encyclopædia Britannica* is a mine of valuable information for the architect. There is scarcely any question connected with the practical application of his art that does not receive notice and discussion somewhere within its pages. The history of architecture is treated with special fulness. The leading article on this subject (in Volume II., pp. 382–475) is a very complete treatise embracing as much matter as is contained in an ordinary 12mo book of four hundred pages. It is enriched with eighteen full-page plates, besides nearly one hundred illustrations. Following it is a Glossary of Architectural Terms (especially classical and mediæval), filling sixteen double-column pages. A supplementary article on AMERICAN ARCHITECTURE,

Leading Article.

sup. 218, contains a number of designs and plans for modern dwelling-houses, with much other valuable matter.

The following are among the numerous subjects of interest which the architect will find fully described or explained in the *Britannica*.

History of Architecture.

Prehistoric structures, II. 383; ancient remains at Karnak, V. 118, XXI. 51; Cromlechs, VI. 597; ancient stone circle at Stonehenge, XXII. 576; tumuli, III. 397; lake-dwellings, XIV. 222; crannogs, VI. 562.

Egyptian architecture, II. 384; pyramids, XX. 122, V. 582; sphinxes, VII. 772; the Serapeum, XXI. 674; labyrinth, VII. 774; tombs, VII. 781, XVI. 865; temples, VII. 786.

Jewish architecture, II. 392; temple of Solomon, XXIII. 166; of Zerubbabel, XXIII. 167; of Herod, XXIII. 168.

Indian architecture, II. 394; Taj Mahal, I. 286.

Assyrian architecture, II. 397.

Persian architecture, II. 399; Persepolis, XVIII. 557; Susa, XXII. 722.

Grecian architecture, II. 401; remains at Mycenæ, II. 346, XVII. 115; the Caryatides, II. 407; Choragic monuments, II. 411.

Three orders of Grecian architecture (Doric, Ionic, and Corinthian), II. 402; Doric, II. 409; Ionic, II. 417; Corinthian, II. 407, IV. 709.

Roman architecture, II. 414; the Pantheon, XX. 828; Colosseum, I. 774; dwellings at Pompeii, II. 420, XIX. 444.

Pointed architecture, II. 422; Gothic architecture in England, II. 425; in France, II. 429; in Germany, II. 431; in Spain, II. 432; in Italy, II. 434.

Modern Italian architecture, II. 436; St. Peter's at Rome, III. 415; II. 438.

Modern English architecture, II. 442; St. Paul's Cathedral, XIV. 837; Sir Christopher Wren, XXIV. 689, XVII. 442; Ely Cathedral, VIII. 155.

Saracenic architecture, II. 445; mosques of Baghdad, III. 232; of Constantinople, VI. 305; great mosque at Damascus, VI. 791; at Mecca, XV. 672; the Alhambra, I. 570.

Chinese architecture, II. 448.

AMERICAN ARCHITECTURE, sup. 218.

Ancient American architecture, II. 450.

Present position of architecture, II. 452.

Architecture at the World's Columbian Exposition, sup. 3200.

Richard M. Hunt, sup. 1634.

Henry Hobson Richardson, sup. 2546.

Richardson and his work, sup. 222.

Among the large number of special subjects relating to practice of this art, the following will be found both valuable and interesting:

Special Subjects.

Abacus, I. 4.
Abbeys, I. 10.
Aisle, I. 430.
Almshouses, II. 459.
Apartment houses, sup. 202.
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Architrave, II. 459.
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Baptistery, III. 352.
Basilica, III. 412.
Campanile, IV. 753.
Caryatides, II. 407.

Cathedral, V. 226.
Chantry, II. 462.
Cloister, VI. 35.
Column, II. 462.
Coping, IV. 464.
Cornice, II. 462.
Cupola, VII. 347.
Dome, VII. 347.
Dormer Window, II. 463.
Entablature, II. 391.
Fresco, IX. 769.
Monastery, I. 10.
Mosaic, XVI. 849.
Moulding IV. 487.
Parapet, II. 469; IX. 421.

ARCHITECTURAL ACHIEVEMENTS.

St. Peter's at Rome, II. 438.
St. Paul's in London, XIV. 837.
York Cathedral, XXIV. 750.

Famous Buildings.

Cathedral of Geneva, VIII. 154.
The Egyptian Temples, II. 388.
The Parthenon, III. 5.
The Atrium, III. 50.

The Colosseum, I. 774.
The Hindoo temples, II. 395.
Jain Temple, I. 423.
The Taj Mahal, I. 286.
The Grand Mosque and the Kaaba of Mecca, XV. 672.
The Bastile, III. 429.
Lara Jongram, IV. 214.
Leaning Tower of Pisa, IV. 753.
Pyramid of Gizeh, XX. 124.
The Escorial, VIII. 539.

The Labyrinth, XIV. 179.

The Capitol at Washington, sup. 219.

For additional references, see the following chapter, entitled *The Builder*.

BRIDGES, FORTIFICATIONS, ETC.

For references to articles concerning the construction of bridges, fortifications, etc., see the chapter entitled *The Engineer*, in this GUIDE.

CHAPTER XXIX.

THE BUILDER.

" In the elder days of art
Builders wrought with greatest care,
Each minute and unseen part,
For the gods see everywhere."

—*Longfellow.*

THE art of building is in a certain sense supplementary to the art of architecture. In its highest application it may very properly be called *practical architecture*. Building, however, is frequently employed when the result is not architectural; and in such case it is the exercise of labor to the accomplishment of a certain useful end, and cannot properly be styled an art. The successful builder ought to possess a scientific knowledge of carpentry, joinery, masonry, and all other trades connected with building; and he should have a practical understanding of the fitness, strength, durability, and resistance of all kinds of materials. The *Encyclopædia Britannica* offers a vast amount of information on all these subjects; it is, in fact, a library of useful knowledge for any person engaged in the building trades.

Practical Architecture.

The special article on BUILDING, IV. 446–513, is in itself a complete treatise on this subject. Each of the various divisions of the builder's trade is considered separately.

MASON-WORK, IV. 468.

Brick, history and manufacture of, IV. 279; ancient

bricks, XIX. 604, 619; enameled bricks, VIII. 182; glazed bricks in wall-linings, XVII. 35; brick as building material, IV. 448; strength of brick, sup. 2799; XXII. 603; brick facings (Roman), XX. 809.

Masonwork.

Bricks and brick-making, sup. 563, describes the most improved processes now in use in the United States.

Briquette machine, sup. 573.

Use of brick in combination with stone, II. 457.

Brick architecture in Germany, II. 432.

Brick-laying, IV. 460.

Mortar, XIV. 647; how mortar is made, IV. 460.

Calcination of lime, XIII. 296.

Quicklime, XXI. 166.

Building-stone, IV. 448, 469, and sup. 614; strength of, sup. 2799; XXII. 603.

Granite, XI. 48, X. 230; sandstone, X. 237.

Limestone, X. 232.

Marble, XV. 528; marble veneer, XVII. 36.

Stone cutting and dressing, sup. 2794.

Concrete, VI. 243, and IV. 453.

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Cements, V. 328.

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Hydraulic cement, XIV. 647.

Stone-pavings, IV. 473.

Paving in bricks and tiles, IV. 466.

Paving-tiles, XXIII. 389.

Mason's tools, IV. 468.

Scaffolding, IV. 457, 468.

Chimneys and flues, IV. 466.

Ventilation by chimneys, XXIV. 159.

Chimney-pieces, IV. 473.

Sewers and drains, IV. 467.

CARPENTER-WORK, IV. 476.

Carpentry with the use of labor-saving machinery, sup. 797.

Carpenter's tools, IV. 476.

Flooring, IV. 452, 482, 493.

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Timber, IV. 448; strength of, sup. 2799; VII. 816, and XXII. 603; shrinkage, IV. 486.

Carpenter-work.

Kinds of wood used for finishing, IV. 486 b.

Mouldings, IV. 487.

Sawing, XXI. 343, XI. 437; sawyer-work, IV. 476.

Planing, XI. 437; XV. 155.

Hanging doors, IV. 491.

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Ventilation by windows, XXIV. 160.

ROOFER'S WORK, IV. 484, and VII. 347.

Roofing.

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Thatch, IV. 501.

Copper, zinc, and tin roofs, IV. 503.

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Sanitary plumbing, sup. 2402.

Radiators for indoor heating, sup. 2489.

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Lead, XIV. 374; solder, XXII. 249.

Lead-pipes and gutters, IV. 502.

Water-pipes, XII. 484; sup. 2403.

Cesspools, tanks, and water-closets, IV. 468.

House drainage, sup. 2403.

Gas-fitting, IV. 510.

PLASTERER'S WORK, IV. 504.

Plastering and Painting.

PAINTER'S AND DECORATOR'S WORK, IV. 510.
Mural decoration, XVII. 34.
Stucco-work, XVII. 36, and IV. 507.
Paper-hangings, IV. 512.
Japanese paper-hangings, XIII. 591.
See, also, Paints or Pigments, XIX. 85.
Body-color, sup. 507.

GLAZIER'S WORK, IV. 509.

Glazing.

Glass, X. 647; window glass, X. 660; plate glass, X. 662.
Putty, XX. 118.
Lead-work, IV. 509.
Stained glass, X. 666, 667.
Pavement lights, IV. 509.

Many other articles of practical value to the builder will be suggested to him from time to time, and can be found by reference to the Index volume of the *Britannica*.

The article on BUILDING ASSOCIATIONS, IV. 513, and especially that on loan and building associations in the United States, sup. 611, is full of practical information, not only for the builders, but for all owners and prospective owners of houses.

For a short list of famous buildings, see page 218 of this GUIDE.

See also the chapters entitled *The Mechanic* and *The Engineer*.

CHAPTER XXX.

THE ENGINEER.

"Do as I have done—persevere."—*George Stephenson.*

ENGINEERING—the art of designing and constructing works—embraces a very wide range of subjects, and the different departments into which the profession is divided do not admit of very strict definition. In this chapter it is proposed to indicate a few of the subjects in the *Encyclopædia Britannica* which have relation to the work of the civil engineer. Among these subjects are the different branches of mathematics, which the GUIDE has already mentioned in the chapter on that subject. To these may be added the articles:

Surveying, XXII. 695, and
Geodesy, X. 163.

Surveying.

Both of these, aside from the purely technical and mathematical portions of which they are largely composed, contain much matter of interest and practical value. (See also Stadia measurement, sup. 2774.) Of other articles there are many, but it is necessary here to name only a few as examples of the quality of instruction and information to be derived from the *Britannica*.

Bridges, IV. 284–341, is a very comprehensive article, with numerous diagrams and illustrations. A supplementary article on the same subject, sup. 564, contains an alphabeti-

cal list of the principal bridges in the world, with descriptive notes on those which are of the most recent construction. Many of these famous bridges are described in separate articles, of which the following are examples:

Bridges.

Brooklyn Bridge, XVII. 465.
Forth Bridge, XX. 234.
St. Louis Bridge, XXI. 185, etc.

Laws governing the erection of bridges, sup. 568.
Caissons (used in bridge-building), IV. 647.
River engineering, XX. 571.
River engineering on the Mississippi, XVI. 520; James B. Eads, sup. 1104.
Engineering at Hell Gate, sup. 1561.
Embankment, VIII. 158.

Aqueducts, II. 219 (chiefly interesting on account of the history which it contains of ancient aqueducts). The modern methods of constructing aqueducts and tunnels are fully described in sup. 211. See also
Railway tunnels, XX. 233.
Tunneling, XXIII. 622.
St. Gotthard tunnel, XXIII. 624.
Sutro tunnel, XVII. 368; sup. 2835.
Viaducts, sup. 3038.

Waterworks, XXIV. 406 (with chapters on reservoir dams, conveyance, purification, storage, and distribution).

Water-works.

Waterworks of London, XIV. 825.
Of Paris, XVIII. 279.
Of New York, XVII. 465.
Of Glasgow, X. 642.

Coffer-dams, VI. 114.

Canals, IV. 782–794 (with diagrams and illustrations).
History of canals and canal construction, sup. 677–683.
Canals.
Suez Canal, XX. 620.
Panama Canal, XVIII. 209.
M. de Lesseps, sup. 1867.

Harbors, XI. 455–465 (with numerous diagrams). Supplementary article relating specially to the harbors and docks of the United States, sup. 1520.
Harbors.
United States Coast Survey, sup. 848.
Docks, XI. 465–472.

Roads, XX. 582; construction of roads, page 582; stone pavements, page 584; wood paving, page 583; asphalt paving, page 586.
Telford road, XXIII. 155.
Roads.
Macadam, the Scotch road-maker, XX. 582, 583.
James Nasmyth, sup. 2138.

Railways (see chapter entitled *The Railroad Man*, in this GUIDE).

Lighthouses, XIV. 615.
The Eddystone tower, page 615.
Light-houses.
Other famous lighthouses, page 616; modes of construction, page 617.
Beacons and buoys, page 625.

Irrigation, XIII. 362; sup. 99 and 1707.
Sewerage, construction of sewers, XXI. 713.
Sewerage, of London, XIV. 826.
Of Paris, XVIII. 280.

Fortifications, IX. 421–468 (a comprehensive treatise, illustrated with numerous diagrams and plates). Especially interesting, even to non-scientific readers, is the history of improvements in permanent fortifications, pages 440–442, and the chapter on the fortification of capitals, page 466. So also is the account of the siege of the citadel of Antwerp, IX. 458, and of the defense of Dantzic, IX. 458.

Fortification.

Other valuable articles are such as the following:

Engineering Societies of the U. S., sup. 1202.
Societies of Engineers, XXII. 226.
Amalgamated Society of Engineers, XXIII. 50.
Naval Engineers, duties of, XVII. 95.
Royal Engineers in the British Army, II. 579.
Strength of materials, XXII. 592.
Eiffel tower, sup. 1128.
Gunnery, XI. 297.
Artillery, II. 655.
Telegraphy, XI. 632.
Shipbuilding, XXI. 809.

Miscellaneous.

See, also, the chapters entitled *The Builder*, *The Seaman*, and *The Machinist*, in this GUIDE.

CHAPTER XXXI.

THE LABORER.

"All true work is sacred; in all true work, were it but true hand-labor, there is something of divineness."—*Thomas Carlyle.*

"Whatsoever thy hand findeth to do, do it with thy might."—*Ecclesiastes.*

NEARLY every chapter in this GUIDE is addressed to the laborer in one or another division of the world's industries. The man who works with his brain is no less a laborer than he who toils with his hands. Hence the teacher, the lawyer, the banker, are as truly laborers as the mechanic, the builder, the farmer, the worker on the roads, the employee of the mill or the factory. "The life of man in this world," says Samuel Smiles, "is for the most part a life of work. In the case of ordinary men, work may be regarded as their normal condition. Every man worth calling a man should be willing and able to work. The honest laboring man finds work necessary for his sustenance, but it is equally necessary for men of all conditions and in every relationship of life. . . . Labor is indeed the price set upon everything which is valuable. Nothing can be accomplished without it."

Who are Laborers?

In the present chapter it is the purpose of the GUIDE to point out some of the many articles and other passages in the *Encyclopædia Britannica* that may be of general interest to all classes of workingmen, and especially to those who labor with their hands. The history of labor is identical with the history of civilization, for without the one the

other could not exist. Workingmen of the present day may learn much that is both interesting and instructive by studying the conditions of labor in former times and in other countries. The *Britannica* affords ample facilities for such study. See, for example, the following articles or parts of articles:

History of Labor.

Labor in early times, I. 294; XIV. 165.
Slavery, XXII. 129.
Labor in England in the Middle Ages, XIV. 166.
Day-laborers in the time of Queen Elizabeth, XIV. 169.
Labor laws in Great Britain, XIV. 171.
The factory system, sup. 2837.
Apprenticeship, II. 212; IX. 760.
Guilds, XI. 259; of London, XIV. 819.

The following articles will be found of greater or less interest to the different classes of workingmen everywhere:

Labor and Capital.

Labor and Capital, XXIV. 48.
Labor and Wages, XXIV. 306.
Labor and Wealth, XXIV. 461.
Labor and Socialism, XXII. 206, 211.
Labor and Communism, VI. 217.
The Sweating system, sup. 2836.

Capital, V. 71.
Capital and Socialism, XXII. 206, 211.
Theories concerning capital, XIX. 374.

Wages.

Wages, XXIV. 306; XIV. 165.
Wages in the United States, sup. 3066.
Payment of wages, XVIII. 440.
Lassalle's theory of wages, XIV. 321.
Marx's theory of wages, XXII. 211.

Enfranchisement of the working classes, XIX. 352.
Progress of the working classes, XXIV. 312.
Legal relations of workingmen and employers, XIV. 170.
Mechanics' Institutes, III. 779.
Industrial condition of women, sup. 1672.

Trade guilds and wages, XXIV. 310.
Unions of workingmen, XXIII. 499.

Labor Organizations.

American Workingmen's Organizations, sup. 1814.
Trade Unions in the United States, XXIII. 786.
American Federation of Labor, sup. 153.
Knights of Labor, sup. 1814.
Ancient Order of United Workmen, sup. 177.
Trade Unions in England, II. 213.
Workingmen's International Association, XIII. 189.

Strikes, XXIII. 500.
Recent great strikes in the United States, sup. 2995.
Boycotting, sup. 539.
Co-operation, V. 338.
Mutual Benefit Societies in the United States, sup. 417.
Mutual Benefit Orders, IX. 782.
Building and Loan Associations, sup. 611.
Agricultural coöperation, I. 416.
Farmers' Organizations, sup. 1245.
International Typographical Union, sup. 1814.
American Railway Union, sup. 1817, 2996.
Labor Parties in the United States, 1817.
United Mine-workers of America, sup. 2995.
Coxey's "Commonweal Army," sup. 2997.

CHAPTER XXXII.

THE FARMER.

"Life in the country is full of practical teachings, which richer folk are apt sedulously to deny to their children."—*A Sussex Idyl.*

"Compare the state of that man, such as he would be without books, with what that man may be with books."—*Lord Houghton.*

FARMER A and Farmer B are neighbors. Their lands join, and each has the same number of acres. Twenty years ago, when they entered upon these lands, they seemed to be on an equal footing in every way. It would have puzzled an expert to tell which of the farms had the best soil, or which was the most favorably situated for the purposes of agriculture. Both men were industrious, although everybody said that Farmer B was the harder worker of the two. Yet, from the very start, Farmer A had always the best success. His crops were better, the products of his farm were of a finer quality, he had fewer losses and fewer expenses, and, in short, everything prospered with him. But Farmer B, in spite of all his industry, fell constantly behind. His lands became less and less fertile every year. His crops failed, his stock died, every enterprise seemed to end in disappointment or disaster.

A Common Illustration.

Now, how can we account for the difference in the fortunes of these two men? We cannot explain it by saying that one was born to good luck and the other to misfortune. It is to be explained in this way: Farmer A

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spared no pains to acquire a thorough knowledge of his calling. He was a reader of books, and through them he availed himself of the experience of others in every department of agriculture. On the other hand, Farmer B placed his entire dependence upon industry alone; and, in the conduct of his business, he had only his own narrow experience to guide him.

The Educated Farmer.

The day of guesswork in farming has passed. In every detail of the farmer's calling knowledge counts for gain. Other things being equal, the land-worker who keeps abreast of the times has an immense advantage over him who is content to plod along in the footsteps of his ancestors.

To the progressive farmer, the *Encyclopædia Britannica* is a mine of useful knowledge. Containing information of the most thorough and trustworthy kind concerning every department of his business, it proves itself to be a ready helper and adviser on all occasions.

The article on AGRICULTURE IN THE UNITED STATES, sup. 89–101, is the work of Hon. J. Sterling Morton, Secretary of the Department of Agriculture, and of Charles W. Dabney, Jr., both of whom rank among the highest living authorities on this subject. It is an article of great practical value, giving just that kind of information which every intelligent farmer in this country wishes to have. The historical portion is particularly interesting, while the statistics relative to United States farms present many facts that are worth knowing. The chapters on crops, sup. 91, *et seq.*, contain much material for thought, and are full of good suggestions.

The general article on AGRICULTURE, I. 291–416, is a comprehensive treatise, covering 125 pages, in which every farmer will find much that is both interesting and

profitable. Although it may be said to present the subject from an English point of view, it is nevertheless replete with that sort of information which farmers everywhere appreciate. To the curious farmer, who would like to know how the work of his craft was done in olden times, the chapter on Ancient Husbandry, I. 291–295, will be full of interest. The relative advantages of "Small Farming" and "Large Farming" are discussed in I. 411–412, and XIV. 268. Truck-farming in the United States is described in sup. 94; and this introduces us to a highly interesting article on LAND, its ownership, distribution, etc., XIV. 259–271.

Farming in General.

An article on HOMESTEADS, XII. 122, contains complete information concerning the Homestead Law in the United States, and the preëmption of claims on Government lands, XII. 123 b". Still later facts in regard to the same subject are given in the article on Public Lands of the United States, sup. 2472. The chapter on the SURVEYS OF PUBLIC LANDS in the United States, sup. 2990, presents much valuable information. The farm-seeker who finds it necessary to lease, instead of buying, or otherwise becoming the owner of his farm, will obtain many practical hints from the article on LANDLORD AND TENANT, XIV. 272–278. He will be interested, too, in reading the chapter on Tenure of Land, I. 406 b", and the article on Rent, XX. 402. The land *owner* will also find many things of interest in these articles, and he will want to read still more of the history of land ownership in AGRARIAN LAWS, I. 287 a.

Land Owning.

The chapter on Farm Buildings; I. 308, will save many a farmer much more than the cost of an *Encyclopædia;* that on Fences, I. 309, is also replete

Buildings.

with valuable suggestions. Not many farmers have to build bridges, but such as do will find something of interest to them in sup. 564. The building of fruit-houses is described in XII. 223 a″, and of plant-houses in XII. 221a″.

Tools.

Next to the subject of buildings, that of implements and tools is of importance to every farmer. These are described in detail and at length in the chapter on Machines and Implements of Husbandry, I. 311–328. See, also,

Harvesting Machinery, sup. 1538.

Corn-harvesters, sup. 1542.

American plows, sup. 2402.

American threshing-machinery, sup. 2905.

Improved straw-stacker, sup. 2907.

Soils.

The successful farmer must also know something about soils. He will find this subject treated in a general way in I. 306; the chemistry of soils is noticed in XIV. 567 b″; the soils best suited for gardens in XII. 217, 232; while the manner in which different kinds of soils were originally produced is described briefly in X. 265.

Fertilizers.

Closely connected with the latter subject is that of fertilizers. Read what is said of Fertilizers, I. 231; of Manures, I. 342, and XII. 232; of the value of Bone Manure, I. 347; of Lime, I. 350; and of Artificial Manures, I. 353. Then turn to the special and very valuable article on MANURES, XV. 505–512, and to that on Guano, XI. 233.

Irrigation.

In some parts of the country irrigation is necessary to the production of crops. Farmers in such sections will find it profitable to read the general article on IRRIGATION, XIII. 362, and perhaps also that which is said about irrigation by sewage, XXI. 512. The very latest facts regarding irrigation in the

United States are given in sup. 99, and sup. 1707. It will also be interesting to read about the curious methods of irrigation practiced in other countries. For instance, the methods pursued in Egypt, VII. 707; in Arabia, II. 244 a; in India, XII. 754; and in Spain, XXII. 299.

Crops.

After soils, and the preparation of the ground for crops (see I. 328–340), we come to the crops themselves. The supplementary article on Wheat in America, sup. 3134, is particularly valuable. A long and valuable article on WHEAT, XXIV. 531, is also worthy of every farmer's attention. Indian corn is described under the head of MAIZE, XV. 309. An interesting history of the potato is given in the general article Potato, XIX. 594, while specific directions as to its culture are to be found in XII. 286 a. The diseases of the potato are described in XIX. 596, while the history and nature of the potato-bug are given in VI. 134 a. Passing now to other grains and vegetables, you will find each treated in its appropriate place—for example: Barley, III. 376, and sup. 355; Oats, XVII. 696; Flax, IX. 293; Hemp, XI. 647.

The special article on COTTON, VI. 482, is interesting and exhaustive. The chapters on Cottons in the United States, sup. 93, 2990, present the very latest statistics concerning this industry. For further information concerning the growth of cotton in the United States, see X. 435 and XXIII. 824. See, also, the reference to textile fabrics in this GUIDE, in the chapter entitled *The Manufacturer*.

Growers of rice will turn to XX. 538, and they will also find pleasure in reading how this grain is cultivated in various countries—in India III. 248, 568; in Japan, XIII. 574; in Java, XIII. 603; and in Madagascar, XV. 172.

The culture of tobacco in the United States receives due attention in sup. 94, in XIV. 43, and in XXIV. 260.

Interesting facts concerning the history and nature of the weed are given in the general article on TOBACCO, XXIII. 424.

Other farm products are the subjects of valuable articles.

Broom-corn, sup. 585.

Buckwheat, sup. 607.

Statistics.

The farmer who cares for statistics relative to the production of FARM PRODUCTS, will find a great deal of trustworthy information in the article on Agriculture, sup. 89, as well as in the chapter on Agriculture in the United States, XXIII. 824–829.

Insects.

Has the farmer any enemies? Yes, many of them; and the successful agriculturist will arm himself against them by becoming acquainted with their character and habits. The article on INSECTS AND INSECTICIDES, XIII. 904, will be found to be of great practical value. So also will the chapters on the Army Worm, sup. 241; the various practical recipes for insecticides, sup. 1684. If you would recognize a friend also, read what is said of the ICHNEUMON FLY, XII. 699. It might be well, too, to read about the TRICHINA, XXIV. 206. Vine-growers will find several matters of practical interest in the section relating to the diseases of the vine, XXIV. 238.

Miscellaneous.

There is a still further endless variety of topics which will claim the attention of the successful farmer. If he is interested in the production of hay, he will want to read the articles on GRASSES, XI. 53, and sup. 1305. If he cares for honey, he will see what is said about BEES, III. 484; about apiarian products, sup. 99; about HONEY, XII. 138, 139, and

about Bee Industry, sup. 398. If he has more apples than he can eat or sell, he will learn all about CIDER, V. 775; if he owns chickens or ducks or geese, he will want to know how to make them profitable, and will read the article on POULTRY, XIX. 644. In fact, the number of subjects of this kind is so large that it is impossible here to enumerate them.

Further References.

And now, Mr. Farmer, are you a gardener or a fruit-grower? Turn to the next two chapters in this book, and notice the references which are given there. You may not be a stock raiser, in the strictest meaning of the word; but we know that you want to have the best breeds of horses and cattle and swine, and in the care of them to avail yourself of the knowledge and experience of others. And so we refer you to the chapter entitled the *Stock Raiser*, in this GUIDE. In that chapter also you will find numerous references to articles relating to milk, butter, cheese, etc., and the most approved and profitable methods of conducting a dairy.

Farming in Other Countries.

Are you interested in what farmers are doing in other countries? Do you want to know what kind of soil they have, what grains they raise, what implements they use? Do you care to learn about their modes of living, or about the profits which they derive from their labor? You will find just such information in the *Britannica*. Look under the head of the country which you have in mind. For example, you will find

Agriculture in Austria, III. 119.
Agriculture in Afghanistan, I. 232.
Agriculture in Arabia, II. 244.
And so with almost every country in the world.

Are you interested in the present trend of American

agriculture? Of course you are. See what Secretary Morton says on that subject in sup. 100. Read also the brief account which follows of the Department of Agriculture at Washington.

Coöperation.

Are you interested in coöperation with others of your calling? Read what is said about FARMERS' ORGANIZATIONS, sup. 1245; about agricultural coöperation, I. 416; about Coöperation in general, VI. 339; and about communities in Europe and America, VI. 218, 219. See, also, the article on World's Fairs, sup. 3195.

The Education of Farmers.

Nearly all enlightened nations recognize the importance of scientific instruction in the practice of agriculture. In Europe there were several agricultural colleges nearly a hundred years ago. In Germany there are scores of institutions in successful operation wherein the sons of farmers are instructed in the best methods of cultivating the soil. There are also many such schools in Belgium, France, and England, and the result is that the lands in those countries produce almost double the amount per acre raised before their establishment. In the United States, where less attention has been paid to this branch of education, the annual crops are almost everywhere growing less per acre. It was not until 1862 that the first national movement was made towards the establishment of Agricultural Colleges An article in sup. 86 gives a complete history and description of the farmers' colleges now in operation in this country. Closely connected with these colleges are the agricultural experiment stations, of which one or more have been established in every state. These stations are intended to promote, under Government auspices, the methodical study of the farmers' problems, and they are very fully described in sup. 87–89. The relations of the Government and its

agricultural stations to the farmer are very aptly stated in sup. 100. The chapter on the Education of Farmers, I. 408, is well worth reading in this connection, presenting as it does some valuable thoughts from an English point of view. As to the manner in which many American farmers try to keep abreast of the times, see Farmers' Institutes, sup. 1245.

Here, then, we have indicated enough reading to occupy your leisure moments for many a day. And as you pursue the study of these subjects, other topics will naturally fall under your eye, and you will see how inexhaustible is the fund of knowledge before you. Can any one now pretend to say that the farmer who has made this knowledge his own will not be vastly more successful in all the departments of his calling than his neighbor whose information is limited to that which he has acquired through personal experience alone? The *Encyclopædia Britannica* is a farmer's library in itself, covering every division of agricultural lore; and its articles, being the work of specialists, are not only complete and comprehensive, but in the highest degree trustworthy and authoritative.

Conclusion.

See the chapter in this GUIDE entitled *The Woodsman.*

CHAPTER XXXIII.

THE GARDENER.

"He that lives in his own fields and the habitation which God hath given him, enjoys true peace. Nothing should hinder him from the pleasure of books."—*Antonio de Guevara*, 1540.

As a matter of course the gardener's interests are, to a large extent, identical with those of the farmer. Every successful gardener must know a good deal about soils, fertilizers, the preparation of the ground, implements and farm machinery, and many other subjects connected with that larger branch of agriculture generally called farming. And so, Mr. Gardener, if you have come to that storehouse of knowledge, the *Encyclopædia Britannica*, for information which will help you in the practice of your calling, we would advise you to turn to some of the articles which we have just named in the chapter for the guidance of the farmer. When you have obtained such information as you wish upon the subjects therein mentioned, you will be all the more ready to profit by the courses of reading and reference which are now to follow.

Gardening in General.

The general article on HORTICULTURE, XII. 211–295, will of course claim your first attention. This is a very comprehensive chapter, and contains as much matter as an ordinary 12mo volume of three hundred and fifty pages. Some portions of the article may be of greater value to you than others. Turn to the Index on page 295, and see what it contains that is of special interest to you.

The chapter on the Formation and Preparation of the

Garden, XII. 217, contains some valuable, practical hints. That on Garden Tools, XII. 233 b; that on Plant-houses, XII. 221 a; and that on the Propagation of Plants, XII. 234 b, will also be found rich in suggestiveness and in direct information.

The Flower Garden.

Is yours a flower garden? Read the chapter on the Flower Garden, XII. 247; that on Kinds of Flowers to Cultivate, XII. 248; that on Greenhouse Plants, XII. 261; and the chapter on Pruning, XII. 241. The article on Floriculture, sup. 1290, contains a number of interesting statistics concerning the progress of this industry in the United States, and will be read with profit by every florist.

The following articles and parts of articles are worthy, as you will at once perceive, of the attention of every gardener and of every lover of flowers.

History of the first attempts at the classification of plants, IV. 79 a.

The story of Linnaeus, XIV. 671, and his classification of plants, IV. 79 b.

The account of Robert Brown, the inventor of the natural system of classification, IV. 81 a″, and IV. 385.

The chapter on Structural Elements of Plants, IV. 83.

The special articles on the ROSE, XX. 850.

Then there are innumerable special articles on the different kinds of flowers, all of which may be found by reference to the Index volume. Among these articles it may not be amiss to call attention to the following:

Lily, XIV. 643
Gladiolus, X. 632.
Geranium, X. 439.
Dahlia, VI. 763.
Pansy, XVIII. 214.
Phlox, XVIII. 798.

Honeysuckle, XII. 140.
Hollyhock, XII. 102.
Hyacinth, XII. 419.
Mignonette, XVI. 289.

But it is unnecessary to name more. These are mentioned only as examples of many articles which lovers of flowers will take pleasure in finding and reading.

There are articles on wild-flowers, too, such as Ranunculus (buttercup), XX. 272; Violet, XXIV. 241; Daisy, VI. 773; and scores of others. And in the general article on BOTANY, IV. 79, their structure, habits, and growth are treated and described from a scientific standpoint.

Wild Flowers.

If you are interested in Landscape Gardening, see the article on that subject in sup. 1828, also the article on LAWNS, XXI. 248, and that on the parks of the United States, sup. 2296. See William Kent, XIV. 40.

Landscape Gardening.

Some curious historical facts in relation to the subject may be found by reference to the article Labyrinth, XIV. 180. The article ARBORICULTURE will also supply some useful hints; and the account of the Royal Botanical Gardens at Kew, XII. 153, and sup. 1785, will be found interesting.

The VEGETABLE GARDEN is described in XII. 278; and the different kinds of vegetables profitable for cultivation are noticed, each in its appropriate place. Market gardening in the United States is the subject of a comprehensive paragraph in sup. 95. See what is said about the Potato, XIX. 593, and I. 364, about its diseases, XIX. 596, and about its most destructive enemy, VI. 134.

The Vegetable Garden.

The manner of raising other root crops, such as turnips, mangel-wurzels, carrots, parsnips, cabbages, kohlrabi, etc.,

is described with some minuteness in the chapter beginning on I. 346. All the common vegetables raised in the gardens receive notice in the *Britannica.* Special articles also are given on the cultivation of these vegetables in the United States, as:

Beets, sup. 402; Beet sugar, sup. 403, etc.

But for the latest information, see the special article on Agriculture in the United States, sup. 89–101.

Market gardens, sup. 95.

Minor crops, sup. 96.

Truck-farming in the United States, sup. 2951.

Truck farms, sup. 94.

See also the references in the chapters entitled *The Fruit Grower* and *The Woodsman.*

CHAPTER XXXIV.

THE FRUIT GROWER.

"They shall sit every man under his vine and under his fig-tree."—*The Book of Micah.*

"You only, O books, are liberal and independent. You give to all who ask, and enfranchise all who serve you assiduously. Truly, you are the ears filled with most palatable grains—fruitful olives, vines of Engaddi, fig-trees knowing no sterility; burning lamps to be ever held in the hand."—*Richard de Bury.*

FOR the fruit grower, be he farmer or gardener, there is to be found in the *Britannica* a great variety of practical, useful information. As to soils, fertilizers, irrigation, and other subjects of general interest to all cultivators of the ground, it may be well to consult the references already given in our chapter for *The Farmer*. In the first volume of the *Britannica*, page 284, there is a short chapter on Orchard Culture which will repay the reading. Of still greater practical interest is a chapter in sup. 95, on Orchard Products of the United States. An extensive list of standard FRUIT TREES, with descriptions of the best varieties, may be found in XII. 269, and should be marked for ready reference. Further descriptions of fruit and fruit trees are presented in special short articles under appropriate headings, for example:

The Orchard.

Apple, II. 211; the culture of apples for cider, V. 775.

Apricot, II. 214.

Peach, XVIII. 442; the peach-house, XII. 224; peaches in the United States, sup. 2330.

Pear, XVIII. 445, sup. 2330.

Plum, XIX. 230.
Prune, XIX. 230.
Quince, XX. 182.

The article on Strawberries, XXII. 592, is interesting and valuable. So also are those on other small fruits:

Small Fruits.

Raspberries, XIII. 276.
Cranberries, VI. 45, and XII. 270.
Whortleberries, XXIV. 556.
Currants, VI. 715, and XII. 270.

The culture of grapes receives the attention which its importance deserves. See the practical chapters on vineyards, XII. 277, and that on vineyards in the United States, sup. 96. See, too, Viticulture, sup. 3056; also the special article on the Vine, XXIV. 237. The manufacture of wine from grapes is described fully in XXIV. 602.

Grapes.

The wines of different localities are referred to elsewhere, as:

Canary wine, IV. 797.
Catawba, V. 219.
Madeira, XV. 178.
Würtemberg, XXIV. 700.

Fruit-houses, for the storing of the products of garden and orchard, are described at length in XII. 223. The entire article on HORTICULTURE, XII. 211–295, is of value to the fruit grower, and should be read and frequently consulted.

Fruit Houses.

See also the account of the societies that have been formed for the promotion of horticulture, XXII. 225.

Tropical fruits are noticed, and described at length. Some of the best known are:

Tropical Fruits.

The date-palm, VI. 831.
The fig-tree, IX. 153; IV. 121.
Banana, III. 307.

Bread-fruit, IV. 241.
Lemon, XIV. 437.
Orange, XVII. 810.
Pine-apple, XIX. 106.
Pomegranate, XIX. 441.

Other articles which commend themselves, not only to fruit growers, but to large numbers of gardeners and farmers as well, are the following:

Care of Trees.
Grafting, XII. 213, 236.
Budding, XII. 237; XX. 423.
Pruning, XII. 214, 241.
Garden Trees, XII. 260.

Fungicides, sup. 1351.
Mildew, XVI. 293.
Diseases of Vines, XXIV. 238.
The Canning Industry, sup. 685.

In the chapter entitled *The Woodsman*, in this GUIDE, the fruit grower may find numerous further references to trees, their culture, propagation, and uses. Many of these articles, if he will take the pains to consult them, may prove to be of genuine value to him.

CHAPTER XXXV.

THE WOODSMAN.

"Love of trees and plants is safe. You do not run risks in your affections."—*Alex. Smith.*

"The love of knowledge comes with reading and grows upon it."
—*Henry Ward Beecher.*

IN this chapter the word woodsman will be used in a broad and somewhat unusual sense. It will include every one who is in any way actively interested in trees, and especially in the trees of the forest. First, the man who regards trees only as objects of trade and profit, and views them always from an economical standpoint, caring for them only so far as they are of practical use to mankind; second, those who love trees for their beauty, their fragrance, their grateful shade, their friendship; and third, those who take pleasure in studying them in their scientific aspects, observing their modes of growth and their influence upon climate, soil, and various forms of vegetable and animal life. For all these "woodsmen" the *Encyclopædia Britannica* has a variety of entertaining and trustworthy information.

I. FORESTRY.

As an introduction to the study of trees, read the article on FORESTRY, sup. 1309. Then turn to the very comprehensive article, Forests and Forest Administration, IX. 396–410, and notice the practical character of the information there given. After this, read of the Forests of the United

States, XXIII. 803–807. Another article of much value is that on ARBORICULTURE, II. 314–324. This, of course, relates especially to the growing of trees as one branch of agriculture. Read particularly the section relating to the culture of trees, II. 315, and that on timber trees, IX. 405, 406. Valuable practical suggestions are also given with relation to plantations of forest trees, II. 322 a. For an account of the timbered region of the United States, see sup. 2390; IV. 704; XXIII. 808. For the forests of Canada, see IV. 773. The climatic influences of forests are discussed in VI. 4.

Lumbering.

Of especial interest to lumbermen is the article on SAW-MILLS, XXI. 344. An account of the lumber trade in the United States is given in XXIII. 811. The trade in Michigan receives notice in XVI. 238, as also does that of Canada, in IV. 774.

The uses of wood as building material are described in IV. 448; its strength, VIII. 816, and XXII. 603; its value as fuel, IX. 808.

II. USEFUL TREES.

It is, of course, impossible in this chapter to name all the articles in the *Britannica* that have reference to individual forest trees. It may not be amiss, however, to direct especial attention to the following:

Timber Trees.

Oak, XVII. 689—an illustrated article very interesting to all lovers of trees; the strength of oak wood, XXII. 603; the use of oak bark for tanning, XIV. 381; the oak in the United States, XXIII. 808.

Elm, VIII. 151 b; culture of, II. 317.

Pine, XIX. 102; strength of wood, XXII. 603; pines of California, IV. 704; pines of the Alps, XIX. 102; culture of, II. 316.

Pine lumbering in the United States, sup. 2390.

Fir, IX. 222; strength of wood, XXII. 603; Scotch pines, XIX. 103.

Boxwood, IV. 181; uses of wood, XXIV. 645.

Rosewood, XX. 851.

Logwood, XIV. 805; XII. 133.

Mahogany, XV. 288; IX. 406; strength of wood, XXII. 603.

Eucalyptus, VIII. 649; XIII. 593: eucalyptus in Australia, XXIV. 216, 508.

The great trees of California are described in IV. 704 and XXI. 673.

Of the trees that are valuable for their products, but not valuable as timber, it may be interesting to note the following:

Valuable Trees.

Cinchona (quinine tree), V. 780. Its cultivation in Peru, XVIII. 673; in India, III. 568, and XII. 751; and in the Himalaya Mountains, XI. 833.

Caoutchouc (india-rubber), IX. 154; XVIII. 673; IV. 226; XII. 835, and IV. 88.

III. FRUIT TREES.

Olive, XVII. 761; III. 59.

Orange, XVII. 810.

Lemon, XVII. 437.

Banana, III. 307; XIX. 176, and XIX. 419.

Mulberry, XVII. 13, and XXII. 58.

But for the common fruit trees, see the chapter entitled *The Gardener*.

IV. FOOD PLANTS AND TREES.

Coffee Plant, cultivation of, V. 110; in Brazil, IV. 227; in Cuba, VI. 681; in Arabia, II. 237; in Java, XIII. 603; in Ceylon, V. 369.

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Tea Plant, XXIII. 97, and IV. 738; cultivation of, in China, V. 636; in India, XII. 750, and III. 568.

Cocoa, or Cacao, VI. 100.

Date Palm, VI. 831, XVIII, 190; of Arabia, II. 237.

Fig, IX. 153.

Almond, I. 594.

Aloe, I. 597.

Bread-fruit, IV. 243.

Among the curious trees of the world, mention may be made of the Banyan, III. 348; Baobab, I. 268; Bo, or sacred fig-tree, IX. 154; Upas tree, XXIII. 859, and this list might be extended indefinitely.

See chapter entitled *The Gardener*.

Parks.

An account of the great parks of the world appeals to the interest of every woodsman and every lover of trees. See the following articles:

National Parks, sup. 2296.

Parks of the Rocky Mountain region, sup. 2297, VI. 161; XXIII. 796.

Adirondack Park, sup. 48.

National military parks, sup. 2297.

Yellowstone National Park, sup. 3219.

Washington Elm, at Cambridge, sup. 662.

Charter Oak, sup. 757.

In conclusion, the reader's attention is directed to the article on Arbor Day, sup. 215, and the additional paragraph on the same subject, XII. 848.

The above references are sufficient to indicate the vast amount of curious, interesting, and instructive information that may be derived from the *Britannica* with reference to this subject of trees.

CHAPTER XXXVI.

THE STOCK RAISER.

"The cattle are grazing,
Their heads never raising;
There are forty feeding like one."
—*Wordsworth.*

"The man who has studied a subject is on that subject the intellectual superior of the man who has not."—*Earl Lytton.*

THE interests of the stock raiser are in many respects identical with those of the farmer. Indeed, most farmers are stock raisers, and most stock raisers are by necessity also farmers. Hence, the references and readings indicated in this chapter are intended for the help and guidance both of farmers and stock raisers, and of all readers of the *Britannica* who are in any way engaged in the breeding or care of domestic animals.

The chapter on stock-raising in the United States, sup. 96, gives much valuable information that is strictly up to date. So also does the paragraph on farm animals in the United States, sup. 2989.

Read the article Breeds and Breeding, IV. 244; then see what is said of the breeding of animals, I. 389, 393, and XXI. 722.

The Horse.

The article on the HORSE, XII. 172, is a comprehensive one, of great value to every horse-owner. This is supplemented by some later facts in the article on Agriculture in the United States, sup. 89–101, and by further information regarding the breeding and rearing of horses, I. 384.

An interesting article on horse-racing in the United States may be found in sup. 1615–1617. After this, see Trotting and Pacing, sup. 2948.

For the Arabian horse, see II. 240.

For the Persian, XVIII. 625.

For the Clydesdale, XIV. 251.

Trotting records, sup. 2948.

Famous trotters and pacers, sup. 2949.

For the diseases of horses, see XXIV. 201, 204.

The art of horse-shoeing is described in XXI. 831 and XVII. 166.

Cattle.

A special article on CATTLE, V. 244, is interesting for its historical information. The chapter on Bovidæ, XV. 432, has a strictly scientific value. The breeding of cattle is discussed in I. 387.

For the diseases of cattle, sup. 97, XVII. 57, XXIV. 204, and I. 304, and V. 589. See also Fardel, sup. 1244; Foot-rot, sup. 1304; Founder, sup. 1320.

The dairyman will read of the management of milch cows, I. 390. He will be especially interested in the long article on the DAIRY, VI. 768; in the chapter on Dairy Products in the United States, sup. 98; in the article on Milk, XVI. 301; Beestings, sup. 402; Butter, IV. 590; and Cheese, V. 455. He will also read what is said of the freshness and purity of milk, and the directions for its treatment in the dairy, XIV. 304. Within recent years the methods of making butter have undergone radical changes, and these methods are described in sup. 638.

See, also, artificial butter, sup. 639.

American process of making cheese, sup. 763.

The influence of cattle-shows, I. 390, is another subject which will claim the cattle-breeder's attention.

One of the chief objects of the stock raiser is to pro-

vide beeves, hogs, or sheep for the great markets, where they are slaughtered and turned into food products. This latter process does not necessarily interest the stock raiser; it concerns rather the butcher and the dealer in dressed meats, and to these it may be a matter of moment to learn how every portion of a slaughtered animal may be made to realize some profit. The latest improved methods of slaughtering beeves and preparing the various parts for market are fully described in an article on ECONOMICAL SYSTEM OF ABATTOIRS, sup. 11. A further and more complete account of the processes connected with the manufacture of flesh-food products is given in the article Packing, sup. 2278.

The Butcher.

The article on SHEEP, XXI, 784, is one of much value to all who have the care of these animals. The breeding and management of sheep are further discussed in I. 391, and IV. 250. The question as to what are the best foods in wool-culture is discussed in sup. 3189.

Sheep.

For Southdowns, see XXII. 725.

For Merinos, XXII. 300.

For Dorsets, VII. 371.

The diseases of sheep are described in XXIV. 204, and XXIII. 539; Murrain, XVII. 59.

The proper method of shearing is described in I. 396.

And in this connection the article on WOOL, XXIV. 653, should be read, together with the supplementary article on American manufactures of wool, sup. 3189.

The American wool-grower will also be interested in what is said of wool-growing in Australia, III. 114. (See also, the references to Textile Products in the chapter entitled *The Manufacturer*, in this GUIDE.

Hogs are treated historically and scientifically in the

article on SWINE, XXII. 773, and notes concerning their breeding and management are given in I. 400.

Hogs.

For the history of hog-raising in the United States during the past ten years, see the chapter on that subject, sup. 97.

Their diseases are described in XXIV. 205, 206, and XVIII. 270.

Poultry is the subject of a valuable article, XIX. 640, wherein the various breeds of fowls are described at length. This is supplemented by an article on FOWLS, IX. 491.

Poultry.

The management of poultry receives special attention in I. 401.

Some interesting facts about eggs are given in VII. 201, and VII. 696; and the latest figures about their production in sup. 99.

The goose is noticed in a special article, X. 777, and the duck in VII. 505; while the turkey is described at length in XXIII. 657.

Of course the question of foods and feeding is one in which the stock raiser and the farmer are always interested.

The subject of pastures and pasturage is intelligently discussed in I. 370, and I. 402, and is worthy of the careful attention of every stock raiser.

Pasturage.

Some account of American grass crops for pasturage is given in XI. 53–60, and the cultivation of American grasses is the subject of an article in sup. I. 305.

The latest facts relating to the production of forage crops in this country are given in sup. 94, and sup. 1305.

For the culture of HAY, see I. 378.

The various grains, vegetables, etc., used in feeding

domestic animals have already been referred to in our chapter for *The Farmer*.

Other domestic animals, not mentioned in this chapter, are treated of, each in its proper place. But the care of them cannot properly be said to belong exclusively to the stock raiser or the farmer. (See the Index volume.)

CHAPTER XXXVII.

THE MINER.

"Excellence is never granted to man but as the reward of labor."
—*Sir Joshua Reynolds.*

MINING, or the process by which useful minerals are obtained from the earth's crust, is treated with great fulness in the *Britannica*. The special article on this subject, XVI. 440–472, is a valuable treatise, amply illustrated with cuts and diagrams, and replete with interesting information for all who are engaged in this branch of industry. It may be read by sections, in connection with collateral references to other articles relating to the different branches of the subject.

Mining.

1. Manner in which the useful minerals occur in the earth's crust, viz., tabular deposits and masses, faults, or dislocations, XVI. 440–442.

2. Prospecting, or search for minerals, XVI. 442–443.

3. Boring with rods and ropes—diamond drills, XVI. 443–444; Quarrying machinery, sup. 2481.

Mining Processes.

4. Breaking ground — Tools employed — Blasting—Machine drills—Driving levels and sinking shafts, XVI. 444–449. See, also, Blasting, III. 808; XXIII. 662.

5. Employment of labor, XVI. 449.

6. Securing excavations by timber, iron, or masonry, XVI. 449–451.

7. Working away of veins, beds, and masses, XVI. 451–455.

8. Carriage of minerals along underground roads, XVI. 455–456.

9. Raising minerals to the surface, XVI. 456–457.

10. Drainage of mines, XVI. 457–459.

11. Ventilation and lighting of mines, XVI. 459–461.

12. Means of descending and ascending, XVI. 461–462. Safety appliances, sup. 2600.

13. Preparation of ores, XVI. 462–467.

14. Laws relating to mining, XVI. 466.

15. Accidents in mines, XVI. 466–467.

For a general description of the methods of coal-mining in the United States, see sup. 841.

For statistics respecting the product of the world's mining, and especially the mineral products of the United States, see XVI. 469.

Mineral Products.

For a special account and description of the minerals of any particular country, see the article relating to that country; for instance, if you wish to know what minerals are produced in India, see under INDIA, XII. 764 a. Also note such references as the following:

Minerals of the Appalachian Mountains, II. 201.

Gold and silver in Bolivia, IV. 13.

Minerals in Borneo, IV. 57.

Minerals in Burmah, IV. 552.

Gold in California, IV. 701.

Minerals in Arabia, II. 244.

Minerals in Australia. III. 109.

Minerals in Cuba, VI. 680.

And hundreds of others of like character.

For interesting historical notes on the discovery and use of certain metals, see METALS, XVI. 63.

Special articles are devoted to all the great minerals, as follows:

The Great Minerals.

COAL, VI. 45–85; classification of coal, VI. 45; origin of, VI. 47; X. 238; anthracite coal of the United States, II. 106, and XXIII. 811; coal-mining, VI. 61 (see Coalfields, in Index volume, XXV. 103); analysis of coal, VI. 80; area of coalfields in the United States, I. 680.

GOLD, X. 740; gold-mining, X. 745, and IV. 791; gold in the United States, XXIII. 811, 814, and sup. 1416; gold mines of America, I. 716; Cripple Creek mines, sup. 944.

SILVER, XXII. 69; description of silver, XVI. 382; silver and silver-mining, sup. 2719; how silver is mined, XVI. 470. See, also, Metallurgy, XVI. 58; and Assaying, II. 724.

IRON, XIII. 278; ores of iron, XVI. 58; iron-mining in the United States, XXIII. 811; rolling-mill product of iron, XX. 1352; iron industry in the United States, XXIII. 813; strength of iron, XXII. 603. (See also Index volume, page 226.)

COPPER, VI. 347; copper-mining, XVI. 452; copper-mining in the United States, sup. 912; production in the United States, XXIII. 816; in Michigan, XVI. 239; copper pyrites, XX. 129; copper-smelting, XXII. 733.

LEAD, XIV. 374; production of lead in the United States, XXIII. 817; in Missouri, XVI. 525; lead-mining, XVI. 465; description of lead ores, XVI. 383.

ZINC, XXIV. 784; production of zinc in the United States, XXIII. 817; treatment of zinc ores, XVI. 465.

TIN, XXIII. 400; ores of, XVI. 58; production in the United States, XXIII. 816; history of mines in Cornwall, VI. 425.

QUICKSILVER, mines and reduction works in the United States, sup. 2990.

Read, finally, the article on METALLURGY, XVI. 57–62, describing the methods used industrially for the extraction of metals from their ores. See also :

Amalgamation of gold, X. 747 ; of silver, XXII. 69 ; mercurial amalgam, I. 652.

Blast furnace, IX. 840.

Assaying, II. 724.

Table of fusibility of metals, XVI. 66.

See the two chapters, entitled respectively, *The Mineralogist* and *The Geologist.*

CHAPTER XXXVIII.

THE GEOLOGIST.

"Sermons in stones, and good in everything."
—*As You Like It.*

THE practical importance of the work of the geologist is now very generally recognized. It is his to investigate not only the manner in which the evolution of the earth's great surface features has been effected, but, by studying the peculiarities of local formations, to discover what important minerals are probably concealed within the earth's crust in given situations; what is the nature of the soil, and, in general, what are the hidden mineral resources of the country. The general article on GEOLOGY, X. 212–375, by the celebrated Archibald Geikie, is a very complete and excellent introduction to the study of this science. It is amply illustrated, and the special index, on page 375, will assist the busy inquirer in finding the answer to almost any question on this subject that may be suggested.

An article of much practical interest to American readers is that on the GEOLOGICAL SURVEY OF THE UNITED STATES, sup. 2832.

The cosmical aspect of geology, X. 213–220, may be studied still further by reference to the article Cosmogony, VI. 446. For additional curious hypotheses concerning the origin of the earth, see I. 460; III. 193; XVII. 143; and XXII. 564.

Dynamical Geology.

Dynamical geology, especially that portion of the subject which seeks to unravel the complicated processes by which each continent has been built up, is further treated under the head of PHYSICAL GEOGRAPHY, X. 210. See also:

Mountains, XVII. 4, 10, and I. 623.
Volcanoes, X. 240.
Earthquakes, VII. 608 (Index volume, page 141).
Rivers, XX. 571.
Lakes, XIV. 216.

Palæontological geology, or the study of organic forms found in the crust of the earth, is the subject of an interesting chapter, X. 319–325. The subject is treated still further in the following articles:

Palæontology.
Distribution, VII. 267.
Birds, III. 728 (see special index, III. 777).
Ichthyology, XII. 666; I. 275.
Ichthyosaurus, XII. 695.

Mammalia, XV. 375 (see special index, XV. 446).
Mammoth, XV. 447.
Fossils of America, I. 682. Fossil footprints, sup. 1317.
Oldest known fossils, IX. 384.

Stratigraphical geology is treated very fully in Volume X., pages 325–370.

Archæan rocks, or formation, X. 327.
Palæozoic, X. 328.
Secondary, or Mesozoic, X. 352.
Tertiary, or Cainozoic, X. 360.
Post-Tertiary, or Quarternary, X. 360.

A further study of these subjects will involve references to the following topics:

Coal, VI. 45.
Coalfields and coal-mines (see Index volume, page 103).
Coalfields of America, sup. 482.

Practical Geology.
Caves, V. 265.
Glaciers (see Index volume, page 183).
Artesian wells, II. 644.

Petroleum, XVIII. 237, 712.
Natural gas, XXIII. 813.

Many other articles which will suggest themselves to the reader as he pursues this study may be found by reference to the Index volume.

In studying the history of the science of Geology, you will find the names of a few distinguished men to whose labors and investigations we are indebted for the greater part of our knowledge concerning this subject. It may be of some interest to you to read the story of their lives. Among these, the following are especially noteworthy:

Geologists.

Sir Charles Lyell, XVI. 101.
Hugh Miller, XVI. 319.
William Buckland, IV. 420.
Sir Roderick Murchison, XVII. 50.
John Phillips, XVIII. 758.
William Smith, XXII. 178.
Alexander Winchell, sup. 1630.
Sir J. William Dawson, sup. 1000.
Joseph Le Conte, sup. 1852.
Jules Marcou, sup. 1990.
John S. Newberry, sup. 2168.

CHAPTER XXXIX.

THE SEAMAN.

"But a great book that comes from a great thinker—it is a ship of thought, deep freighted with truth, with beauty, too."—*Theodore Parker.*

I. SHIPBUILDING.

THE subject of greatest importance to all navigators is ships. The history of shipbuilding, from the first rude efforts of primitive man to the wonderful achievements of the present time, is a topic full of interest to both seamen and landsmen. In the twenty-first volume of the *Encyclopædia Britannica*, page 804, there is a readable and very entertaining article on the development of the ship and of the art of navigation, particularly in ancient and mediæval times. The ships of the Phœnicians, the first race of seafaring men, are further described in XVIII. 804. The ships used by the Greeks in the time of Homer, and also the war vessels, biremes and triremes, used in the earliest sea fights, are noticed at considerable length in the pages which follow. Mediæval merchant vessels are described on page 808.

History of Ships

The very exhaustive article on SHIPBUILDING, XXI. 809–826, contains much information of general interest. Read the introductory paragraphs, page 809, the description of the "Great Western" and the "Great Eastern," page 815, the paragraphs on Propulsion, pages 822, 823, and the section on Boatbuilding, page 825.

Primitive boat of wicker-work, III. 421.
Whaleboat, XXIV. 526.
Boats. Boatbuilding, XXI. 825.
Rowing, XXI. 29.
Life-boat, XIV. 570.
Canoes, IV. 811.
Catamarans, sup. 722.
Yachts and yachting, XXIV. 722.
Yacht-building, sup. 3215.
Steamboat, XXII. 478.
Ships, etc. Steamships, XXI. 823; III. 542; sup. 2781.
Whaleback steamers, sup. 3133.
Marine engines, sup. 1992.
The Campania and Lucania, sup. 2782.
The Great Eastern, IV. 397; XXI. 815.
The Great Western, IV. 397.
The Great Harry, XVII. 281.
Oars, XXI. 30; ancient oars, XXI. 807.
Rowing, sup. 2584.
Sails and sail-making, XXI. 153.
Mast, IV. 477.
Spars and rigging, XXI. 594.
Rudder and helm, XXI. 602.
Cable, IV. 621.
Nautical Capstan, V. 28.
Subjects. Anchor, II. 3.
Mariner's compass, VI. 225; XV. 518.
Sextant, XXI. 724.
Sailors' knots, XIV. 128.
Bends and splices, XXI. 592.
Log, XIV. 769.
Speed recorder, sup. 2764.
Marine glue, sup. 1412.

II. NAVIGATION.

The article on NAVIGATION, or the art of conducting a ship across the ocean, XVII. 250–277, next claims our attention. The first half of this article contains a good deal of valuable historical information. The latter half is more technical and scientific, and is an exhibition of the theory and art of practical or modern navigation. A popular course of reading would include the following articles or parts of articles:

Dockyards, VII. 310; wharves, sup. 3133.
Clearance, sup. 826.
Sounding, XXII. 49.
Buoys, IV. 530.
United States buoy service, sup. 623.
Naval signals, XXII. 49; sup. 2716.
"Law of the road" at sea, sup. 2556.
Fog signals, sup. 1296, 2556.
Search-light, sup. 2670.
Lighthouses, XIV. 615.
Lighthouse Board, sup. 1885.
Life-saving service in the United States, sup. 1882.

Sea Terms.

Latitude, X. 198; XVII. 251.
Longitude, XXIII. 394; X. 187, 198.

Tides, XXIII. 353.
Ocean currents, X. 283; XVII. 275.
Gulf Stream, III. 19.
Trade-winds, XVI. 143.
Derelicts, sup. 1031.
Log, XIV. 769.
Marine league, sup. 1996.
Harbors and docks, sup. 1520; harbors, XI. 471.
Law of ports, XI. 471; free ports, sup. 1337.

Bottomry, IV. 167.
Tonnage, XXIII. 442.
Salvage, XXI. 237.
Marine insurance in the United States, sup. 1995.
Marine hospital service, sup. 1994.
Captain, XVII. 292.
Boatswain, XVII. 293.
Pilot, XIX. 96.

STEAMSHIP, XXI. 589–605. This article embraces a great variety of information relative to the duties and labors of a seaman; how to make knots, bends, and splices, page 592; how to distinguish and name the spars and rigging of different kinds of vessels, page 594; how to lower rigging and set up stays, page 595; how to cast anchor, page 597; all about mooring swivels, anchors, and cables, page 598, etc. At the end of the article, page 603, there is a complete glossary of terms used by seamen.

Seamanship.

Laws relating to seamen, XXI. 605–608.
Shipping laws, sup. 2706.
International Commission for deep waterways, sup. 3103.
Commerce on the great waterways—see the chapter entitled *The Merchant and Trader.*

III. SEA INDUSTRIES.

Sea fisheries, IX. 243.
Whale fisheries, XXIV. 526; whale-oil, XVII. 744; whalebone, XXIV. 528; XV. 394.
Seal fisheries, XXI. 580; sealskins, IX. 839; extermination of seals, XIX. 126.
Coral fisheries, XXI. 387; XIII. 455.
Sponge fisheries, XXII. 428.
Amber deposits in Baltic Sea, I. 659.

Fisheries.

Oyster fisheries, XVIII. 107.
Pearl oysters, XVIII. 446.
Cod fisheries, VI. 103; off Newfoundland, XVII. 384; in North Sea, IX. 255.
Mackerel fisheries, XV. 160.
Herring fisheries, IX. 251, 257.
Sardine fisheries, IX. 253; XIII. 455.

Salmon fisheries, XXI. 225.
Shad fishery, XXI. 726; XII. 694.
Lake fishing, II. 39.

Fishing-boats, IX. 246.
Fishing-nets, XVII. 358.
Fishery Boards and Commissions, XIX. 129.
Laws relating to fishermen, XXI. 607.
Fishery laws, IX. 268.

Fisheries of the United States, XV. 300.
Fisheries of Newfoundland, XVII. 384.
Fisheries of England, VIII. 233.
Fisheries of Canada, IV. 774.
Fisheries of Russia, XXI. 85.

IV. WONDERS OF THE SEA.

Depths of the sea, III. 17; XII. 821.
Deep-sea sounding, XXII. 280.
Description. Waves, XXIV. 419.
Tides, XXIII. 353.
Animals in the sea, VII. 276.
Color of the sea, XIV. 600.
General description of the sea, XXI. 578.

Sea-anemones, I. 129.
Sea-bear, XV. 443.
Sea-cat, XXI. 614.
Curiosities. Sea-cow, XV. 390.
Sea-cucumber, III. 477.
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The Navy. Naval Academy of the United States, sup. 2142; XVII. 300, 301.
Naval Observatory, sup. 2143.
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VI. MISCELLANEOUS.

Boat-races, sup. 2584.
Dredges and dredging, sup. 2782.

For further references relating to ships, canals, and commerce, see the chapter entitled *The Merchant and Trader*.

CHAPTER XL.

THE RAILROAD MAN.

"What Mr. Robert Stephenson recently said of the locomotive, at a meeting of engineers at Newcastle, is true of nearly every other capital invention: 'It is due,' he said, 'not to one man, but to the efforts of a nation of mechanical engineers.'"—*Samuel Smiles.*

I. DEVELOPMENT OF THE RAILWAY.

NOT only railroad men, but all intelligent readers, will be interested in the story of how the modern railway has been developed from the old tramways of two hundred years ago—a story which is briefly but entertainingly told in the twentieth volume of the *Britannica*, beginning on page 223.

Evolution of the Railway.

Other interesting facts relative to the development of the railroad may be learned from the following references:

George Stephenson, XXII. 537.

Isambard Kingdom Brunel, IV. 396.

Development of railroads in the United States, sup. 2501; XX. 253.

Latest facts concerning railroads in the United States, sup. 2490.

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Laws relating to railways, XX. 250.

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Use of railways in time of war, XXIV. 349.

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III. ENGINES AND ROLLING-STOCK.

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Mogul engines, sup. 2493.
Mathias W. Baldwin, sup. 325.
Traction engines, XXII. 522.
Traction on railroads, XX. 246.
Electricity as a motor, sup. 2499. (See also references in the chapter entitled *The Electrician.*)
Application of electricity, XX. 250.

Electric cars, sup. 695.
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Latest improvements in passenger cars, sup. 2494.
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Safety appliances, sup. 2495.
The Westinghouse brake, XX. 249.
Railway brakes, XX. 240.
Standard air brake, sup. 547.
Snow-plows, sup. 2741.

American Railway Union, sup. 1005, 1817.
John Henry Devereaux, sup. 1036.
Eugene V. Debs, sup. 1005.
See, also, the chapters in this volume entitled *The Inventor, The Engineer, The Machinist, and The Mechanic.*

CHAPTER XLI.

THE SOLDIER.

"In books warlike affairs are methodized; the rights of peace proceed from books."—*Richard de Bury.*

I. WAR

AMONG the many articles in the *Britannica* which are of especial interest to the soldier, perhaps there is none of greater practical value than that on War, XXIV. 343–366. This is, in short, a comprehensive treatise on the effective organization and employment of armies in active warfare. To officers in the military service its importance will be at once apparent. The first section of the article is of an historical character, and will appeal to the interest of the non-military reader as well as to that of the soldier. Other sections relate to strategy, page 349; infantry tactics, page 354; cavalry tactics, page 358; and artillery tactics, page 359. It concludes with a special chapter on naval strategy and tactics, page 363. See Declaration of War, sup. 1011; and War Department, sup. 3079.

War.

II. ARMIES.

The article ARMY, II. 559–619, is of no less interest. The history of the armies of ancient and mediæval times, which occupies the first four pages, is of importance to every student. This is followed by other historical sections equally valuable — as, Modern armies, page 563; the British army, page 568.

The Army.

After this, the great armies of the world are each described in a separate chapter:

British army, II. 572; its present condition, sup. 1450.
German army, II. 593.
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Army of modern Greece, sup. 1458.
Other European armies, II. 614.
Army of the United States, II. 619, with a supplementary article giving the latest statistics, sup. 238.
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III. ARMS AND ARMOR.

Arms and armor (an historical article with illustrations), II. 553–558.
History of the sword, XXII. 800.
Bows and arrows, II. 371.
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- Machine-guns, sup. 1481.
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Military academies in the United States, sup. 2061.
Military colleges and schools, sup. 2063.
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VIII. BATTLES OF THE CIVIL WAR.

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Chattanooga (1863), sup. 761.
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Fair Oaks (May 31, 1862), sup. 1239.
Five Forks (April 1, 1865), sup. 1284.
Franklin (Nov. 30, 1864), sup. 1329.
Fredericksburg (Dec., 1862), sup. 1334.
Gaines's Mill (June 27, 1862), sup. 1357.
Gettysburg (July 1–3, 1863), sup. 1390.
Malvern Hill (July 1, 1862), sup. 1977.
Pittsburg Landing (April 6–7, 1862), sup. 2397.
Spottsylvania Court House (May 7–12, 1864), sup. 2770.
Siege of Vicksburg, sup. 3040.
Surrender of Vicksburg (July 4, 1863), XXIII. 780.
The Wilderness Campaign (1864), sup. 3151.

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Robert Bruce, XX. 592.
The Black Prince, VII. 686.
Earl Warwick, XXIV. 381.
Oliver Cromwell, VI. 597.
Gustavus Adolphus, XI. 333.
Peter the Great, XVIII. 698.
Frederick the Great, IX. 735.
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Ulysses S. Grant, sup. 1442.
Robert E. Lee, XIV. 399.
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"Chinese Gordon," sup. 1425.

CHAPTER XLII.

THE AMERICAN CITIZEN.

"The worth of a State in the long run is the worth of the individuals composing it."—*John Stuart Mill.*

IT is proposed in this chapter to indicate a few of the leading articles in the *Encyclopædia Britannica* which relate to the science of government, and which are therefore of especial interest and value to every citizen who has a voice in the conduct of public affairs, no less than to students, professional politicians, and statesmen.

Let us take as the basis of our studies the Constitution of the United States, the full text of which is given in the American Supplements, page 900. Read next the article CONSTITUTION AND CONSTITUTIONAL LAW, VI. 309, from which you may derive some idea of the English Constitution and of the points wherein it differs from our own. Then the following courses of reading may be taken up, either independently or in the order in which they are here mentioned:

I. ON GOVERNMENT IN GENERAL.

GOVERNMENT, XI. 9–21. This is a thoughtful and interesting article (1) on the forms of government, (2) on the sphere of government. Under the first division is an account of the three standard forms of government, the monarchy, the aristocracy, and the republic. Then follow chapters on:

Forms of Government.

The government of Rome, page 11.

Feudalism, page 11.
Parliamentary government, page 12.
Cabinet government, page 13.
The relation between government and laws, page 14.

Under the second division the following topics are discussed:

Judicature, page 15.
State and Church, page 16.
Sphere of Government. The *laissez-faire* theory, page 17.
Education and labor, page 18.
Federal government, page 20.

Among the numerous shorter articles on special divisions of the subject, the following deserve careful reading:

Patriarchal government, XVIII. 410.
MONARCHY, XI. 11; monarchy in ancient
Monarchy. Rome, XX. 732.
Emperor, VIII. 179; empire, VIII. 181.
House of Lords, VIII. 259.
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Parliament, XVIII. 302; powers and privileges of parliament, page 310.
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ARISTOCRACY.—Nobility, XVII. 524.
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Aristocracy, etc. The nobility of England, page 529.
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REPUBLIC, XI. 11.
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The republic and socialism, XXI. 221.
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II. HISTORY OF AMERICAN POLITICS.

1. *Foundation Principles:*
Declaration of Independence (full text), sup. 1010.
Articles of Confederation (full text), sup. 252.
Constitution of the United States (full text), sup. 900.

2. *Political Parties:*
Federalist Party, sup. 1253.
Anti-Federal Party, sup. 198.
Democratic Party, sup. 1023; XXIII. 755.
Whig Party, sup. 3137.
Free-Soil Party, sup. 1338.
Anti-Masonic Party, sup. 198.
Political Parties. Native American and Know-Nothing Party, sup. 165.
Republican Party, XXIII. 757; sup. 2535.
Greenback Party, sup. 1461, 1818.
People's Party, sup. 1819.
Labor parties, sup. 1817.
Socialistic Labor Party, sup. 1819.
Mugwumps, sup. 2123.
Prohibition Party, sup. 2453.

3. *Departments of Government.*
(1). Executive Department, sup. 1228.
Presidential Elections, sup. 2987.
Powers of the President, XXIII. 750.
Department of State, sup. 2779.
Treasury Department, sup. 2937.


LIBRARY OF THE UNIVERSITY OF CALIFORNIA

War Department, sup. 3079.
Department of the Interior, sup. 1686.
The President. Department of Justice, sup. 1843.
Veto, XXIV. 206; XXIII. 749.
Casting vote, sup. 720.
List of Presidents, XXIII. 787.

(2). Legislative Department—Congress of the
Congress. United States, sup. 891.
History of Congress, sup. 2984.
Senate and House of Representatives, XXIII. 749.
The franking privilege, sup. 1328.

(3). Judicial Department—Supreme Court of
Supreme Court. the United States, II. 210; XIII. 789; sup. 2824.
See the chapter in this GUIDE entitled *The Lawyer*.

4. *Citizenship.*
Citizenship in the United States, sup. 808.
Immigration into the United States, sup. 1657.
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Allegiance, I. 580.
Qualifications of voters in the different States, sup. 1131.
Electors, sup. 1132.
Elections. Ballot III. 288; Australian ballot system, sup. 329.
Voting-machine, sup. 3062.
Elections, VIII. 2; election laws in the States, sup. 1131; primary elections, sup. 2444.
State governments, XXII. 458.
Local governments—the borough, IV. 62; the town, XXIII. 731.
Civil rights, sup. 811.
Disfranchisement, sup. 236.
See especially Civics, sup. 809.

5. *Relations with other Governments.*
Treaties, XXIII. 530.
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6. *Miscellaneous Topics:*
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Amnesty, I. 746.
Reconstruction, sup. 2518.
Finances of the United States, sup. 1267; national debts, XII. 889; debt of the United States, sup. 1005; debts of various countries, sup 1007.
See *The Banker and Financier*, in this GUIDE.
Indian affairs of the United States, XII. 822–833; sup. 1665.

7. *Important Passages in the Political History of the United States:*
Declaration of Independence, XIII. 614.
Alien and Sedition laws, sup. 126.
Whisky rebellion, sup. 3138.
Monroe Doctrine, sup. 2091.
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Slavery in the United States, XXII. 141.
John Brown's raid, IV. 385; XI. 490; XXIII. 772.
Civil War, XIV. 659.
Draft riots of 1863, sup. 1075.
Reconstruction, sup. 2518, XXIII. 784–787.
Crédit-Mobilier scandal, sup. 939.
Clayton-Bulwer treaty (relating to ship canals), sup. 825.
Chinese Exclusion Act, sup. 792, 2994.
Behring Sea Question, sup. 428, 2994.
The "Crime of 1873," sup. 942.
Electoral Commission of 1877, XXIII. 787; sup. 1132.
The "Force Bill" (Federal Elections bill), sup. 1307.
The Fisheries Question, IX. 268, 269; sup. 1280.
Position regarding Hawaiian independence, sup. 1549.
The Venezuelan Question, sup. 2999.
The National Election in 1896, sup. 3000.

A SHORT COURSE OF READING IN POLITICAL BIOGRAPHY.

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Pericles (B. C.), XVIII. 529.

Patriots and Statesmen.

Cato (B. C. 95), V. 240.
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Oliver Cromwell (17th century), VI. 597.
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Charles Francis Adams, sup. 43.
James G. Blaine, sup. 238.

See, also, the chapters in this GUIDE entitled, respectively, *The Public Speaker*, *The Lawyer*, and *The Political Economist*.

CHAPTER XLIII.

THE CANDIDATE FOR CIVIL SERVICE.

"I have done the State some service, and they know it."—*Othello.*

History of Civil Service.

THE first practical steps toward what is designated as Civil Service Reform were taken by the United States Congress in 1853, when it passed an act providing for competitive examinations as the basis of appointment to any place in the four great classes of clerkships in Washington. Little further progress was made towards freeing the executive department of government from the abuse of official patronage until the year 1872, when President Grant appointed a commission to devise rules and regulations for "admission to and continuance in the civil service of the United States." But the proposed reform met with much opposition from parties who were interested in the continuance of the "spoils" system, and it was still several years before any practical application of such rules and regulations could be made. During the administration of President Hayes, in 1879, the system of competitive examinations was made applicable to a few of the largest post-offices, including the post-office in New York. Through the persistent efforts of the opponents of official corruption, an act of Congress was passed in 1883 providing for the appointment of three Civil Service Commissioners, who should aid the President in prescribing rules for admission, by examination, into certain branches

of the civil service. This act further empowered the President to revise or modify the rules from time to time, thus enabling him to extend the system of competitive examinations as rapidly as in his judgment would conduce to the public welfare. (See sup. 2994.)

On the 9th of May, 1896, the President extended the provisions of the civil-service law to 30,000 additional Government employees, thus increasing the number of positions on the classified lists to 85,135.

So many governmental positions being now obtainable, not by personal favor or the influence of friends, but by absolute proofs of ability to fill them, it has become the laudable ambition of thousands of young men and young women to pass the civil-service examinations, and thus place their names upon the lists of available candidates. Changes in the service are constantly taking place; vacancies in all departments are of frequent occurrence. About six thousand new appointments to the service of the Government are made every year. As a rule, the candidate whose grade in examination is the highest is the first to be appointed.

Examinations.

It is evident that to pass one of these competitive examinations even creditably, the candidate must make some preparation: he must know what are the subjects he will be examined upon, and he must study these subjects with special care. Now it is a fact well worth noticing that there is no other single book in the world that contains so much information on all subjects as the *Encyclopædia Britannica;* and it is the purpose of the present chapter to show how the candidate for any branch of the civil service may utilize its information so as to obtain therefrom much practical knowledge in preparing for the examinations.

The "Britannica" a Helper.

A. THE FEDERAL SERVICE.

All persons who assist in the conducting of the government of the United States may be said to be in the service of the nation. There are three general branches or departments of government:

Executive Department.

The Legislative Department, sup. 891.

The Judicial Department, sup. 2824.

The Executive Department sup. 1228.

Read the Constitution of the United States, sup. 900.

Civil service, as generally understood, has reference only to service in the executive department of the Government. In this department there are also two other branches of service:

The military service. (See *The Soldier*, in this GUIDE.)

The naval service. (See *The Seaman*, in this GUIDE.)

By an Executive order issued by the President, November 2, 1896, the employees of the Navy Yard are practically included within the classified service. In the War Department, also, about 10,000 employees are now subject to the civil service regulations. Half of this number are employed under the Chief of Engineers in the improvement of rivers, harbors, and fortifications. (See *The Engineer*, in this GUIDE.)

Members and employees of Congress, ministers, most of the foreign consuls, collectors of revenue, postmasters, and many others, including more than 100,000 persons, belong to the unclassified service, and are exempt from the civil-service regulations. It is of those only who are engaged in the classified service that we shall speak in this chapter.

Exceptions.

The classified service, for which examinations are held, is divided into five distinct branches:

(1) The Departmental Service, which includes officers

and employees (except laborers and persons who have been nominated for confirmation) in the several executive departments of the District of Columbia (VI. 168; sup. 1054), the railway mail service (sup. 2490), the Indian service (sup. 1665), the pension agencies (sup. 3344), the steamboat inspection service (sup. 2781), the lighthouse service (sup. 1885), the life-saving service (sup. 1882), the mints and assay-offices (II. 724; XVI. 480), the revenue-cutter service, the sub-treasuries of the United States (sup. 2937), the engineer departments, and all officers and employees of the executive department outside of the District of Columbia who are employed as clerks, physicians, nurses, draftsmen, engineers, watchmen, messengers, or firemen, or who are in the service of the Supervising Architect's Office, or in the service of the Treasury Department (sup. 2937).

Divisions of the Service.

(2) The Custom-house service, which includes all officers and employees in any customs district whose employees number as many as five (VI. 729).

(3) The Post-office service, which includes all officers and employees in any free delivery post-office.

(4) The Government Printing service, and

(5) The Internal Revenue service, which includes all officers and employees engaged in these branches of service, except such as have been declared not subject to the civil-service rules.

To test an applicant's fitness for a position in any of the five branches of service named above, examinations are held under the direction of the commission. The examination papers are rated on a scale of 100, and 70 marks or over are considered as entitling the candidate to eligibility for appointment. But, as already observed, those who receive the

Examination Papers.

first appointments are those who stand the highest in the examinations.

I. THE DEPARTMENTAL SERVICE.

There are many positions in this service, the most important of which are the following: Clerk-copyist, messenger, watchman, typewriter, stenographer, printer's assistant, proof-reader, telegraph operator, special pension examiner, state department clerk, bookkeeper, weather observer, draftsman, meat inspector, fish culturist, tagger, stock examiner, engineer and machinist, railway mail clerk, and teachers, physicians, nurses, and others employed in the Indian service.

What is the character of the examinations for eligibility to these positions?

How can the *Encyclopædia Britannica* aid candidates who are preparing for these examinations?

The clerk-copyist is examined in orthography, penmanship, copying, letter-writing, and arithmetic.

The examination in orthography includes the writing of twenty or more difficult words from dictation by the examiner. The mark on penmanship is determined by legibility, rapidity, neatness, and general appearance, and by correctness and uniformity in the formation of words, letters, and punctuation marks. In copying, the candidate is required to make a fair copy of a rough-draft manuscript, punctuating and capitalizing properly, and writing in full all abbreviated words. (See the references to punctuation and capitalization in the chapter entitled *The Writer*, in this GUIDE; see also the lists of abbreviations in the *Britannica*, I. 26, and sup. 16.) The letter-writing is intended to test the candidate's skill in simple English composition (see *The Writer*, in this GUIDE). In marking the letter, its errors in form and ad-

Clerk-Copyist.

dress (sup. 46), in spelling, and in punctuation are considered. The letter must relate to some subject given by the examiners, as for example, "The advantages of a common-school education." (See *The Teacher*, in this GUIDE.) The examination in arithmetic consists of problems involving the fundamental principles of the science. (See references on page 131 of this GUIDE.)

Typewriter.

Nearly all other competitors for employment in the departmental service are examined in the branches named above. Several, such as the typewriter, the stenographer, and the telegraph operator, are required to exhibit practical tests of their skill. (See *The Stenographer and Typewriter*, in this GUIDE.)

The pension examiner is examined not only in the five subjects mentioned, but in law and pension law.

Sample Questions in Law. What is the difference between primary and secondary evidence? (See VIII. 173.)

What is marriage, and what are impediments to lawful marriage? (See XV. 565; XII. 400.)

What is divorce? (See VII. 300–305.)

Pension Examiner.

(For much information relative to pension law, see sup. 2344.)

The State Department clerk is examined in geography, history, international law, government. The following are sample questions:

Geography.

Between what parallels and meridians does the United States extend? (See map, XXIII. 790; Parallels, XVIII. 254; Meridians, X. 198.)

What are the boundaries of France (IX. 504), of Germany (X. 448), of Ohio (XVII. 736), of Vermont (XVII. 392)?

(Study the references in the *Readings in Geography*, in this GUIDE.

What circumstances led to the war with Mexico? (XXIII. 767.)

History. Mention the leading facts in the life of Franklin. (IX. 711.)

Name the political parties in the national election of 1860. (XXIII. 774 *et seq.*)

(Study the *Readings in History*, Course I., in this GUIDE; also *The American Citizen.*)

What is international law? (XIII. 190; XXII. 471.)

International Law. Give some account of the origin and meaning of the "Monroe doctrine." (XIII. 192; XVI. 761; XXIII. 762.)

What are the rules regulating sovereignty over the high seas? (XXIII. 195; XXI. 583.)

What are the functions and powers of the Secretary of State? (XXIII. 750.)

Government. To what extent are the various States of the Union sovereign powers? (XXXIII. 741, 746, 750, 756, 763, 774.)

What constitutes a treaty? (XXIII. 530.)

(Study the references given in the chapter entitled *The American Citizen*, in this GUIDE.)

The observer in the weather bureau is examined in meteorology and physics, as well as in the five general branches previously mentioned. Some of the questions are similar to the following:

Explain how a barometer may be used in determining the height of a mountain. (III. 381; XIX. 241.)

How are the freezing and boiling points of a thermometer determined? (XXIII. 288; XI. 563.)

Meteorology. What is relative humidity, and how is it obtained? (III. 33; XII. 569.)

(See Atmosphere, III. 28, 381; X. 211, 220; Meteorology, XVI. 114; Winds, XVI. 143; Temperature

(Heat), XI. 555; Climate, VI. 1; Frost, X. 265, 280; Rain, XVI. 128; Snow, XVI. 154; Corona, VI. 428; and especially the *Readings in Meteorology*, in this GUIDE.)

Physics.

What is meant by the density of a body, and what substance is taken as the standard of comparison? (XV. 698; VII. 241.)

State three laws of falling bodies. (XI. 68.)

(See *Readings in Physics*, in this GUIDE.)

The topographic draftsman is examined specially in geography, scale drawing, and geographic projections. The scale drawing consists of compiling, on an enlarged scale, a chart, a copy of which is furnished at the time of examination. (See Cartography, XV. 515; X. 191; Topographic Maps, XV. 522; Drawing, VII. 446; XV. 628.) Geographic projections relate to the theory of polyconic and Mercator projections, and to instruments and appliances necessary to construct polyconic projections. (See X. 208, 209.)

Draftsman.

The meat inspector is examined in veterinary anatomy and physiology, in veterinary pathology, and in meat inspection. He may be asked many questions similar to the following:

Name and give the situation of the organs which should be examined for the detection of tuberculosis in cattle. (XXIV. 204.)

Meat Inspection.

What are the symptoms of milk or parturient fever? (XXIV. 204.)

What is pus made up of, and how does it appear to the naked eye? (XXII. 683.)

What are the characteristics of good, sound flesh meat? (XV. 782.)

Describe the appearance and give the life history of trichinæ? (XVII. 325; XXIV. 206.)

(See, also, Animals, II. 49; Animal Physiology, XIX. 10; Animal parasitism, XVIII. 258; Beef-measle, XXIII. 52; Poisonous, tainted, or diseased meat, XV. 782; Diseases of Cattle, XVII. 57, etc. Also the chapter entitled *The Stock Raiser*, in this GUIDE.)

The fish culturist is examined, in addition to other subjects, in geography and fish culture. The questions in geography have reference principally to the United States, and presuppose an intimate knowledge of the lakes, seas, and interways of the western continent. The examination in fish culture is intended to test the competitor's knowledge concerning the geographical distribution of fishes (XII. 668); definition and description of varieties (XII. 685); methods of reproduction (XX. 409); conditions of successful fish culture (XIX. 126; XXI. 226); transport of fish (IX. 243); propagation of different species, etc.

Fish Culture.

(See Salmon, XXI. 220, 224, 226; Shad, XXI. 726; XII. 694; XIX. 128; Pike, XIX. 88; Perch, XVIII. 521; Trout, XXI. 221, 225, etc. Read the articles on Angling, II. 32; on Fisheries, IX. 243; on Ichthyology, XII. 630; on Aquariums, II. 217; etc.)

The engineer and machinist, besides being examined on the five general subjects, is required to answer questions in regard to the various parts of an engine (XXII. 473–526), and the construction of the boiler (XXII. 496); and to exhibit a practical knowledge of packing, repairing and managing engines and boilers, (See the chapter entitled *The Engineer*, in this GUIDE.)

Steam Engine.

The railway mail-clerk is examined specially in the geography of the United States (XXIII. 790); in railway and other systems of transportation in the United States, and in reading addresses.

Railway Mail Clerk.

The candidate for this examination will find many articles in the *Britannica* that will be of assistance to him. See *The Railroad Man*, in this GUIDE; also

Post-office, XIX. 562.

International Postal Union, XIX. 584.

Plan of U. S. postal service, XIX. 578.

Post-offices in the United States, sup. 24.

Railways in the United States, sup. 2490.

His examination in Arithmetic may embrace some such questions as this: A railway mail clerk decided to save $\frac{1}{3}$ of his salary during one year, but instead, he saved $\frac{3}{8}$, and found that during the year he had saved $30 more than he had decided to save. What was his salary?

The Indian Service. The examinations for this service are for the most part topical rather than textual. Instead of questions, the candidate is given topics upon which to write essays or to prepare lessons, and these are intended to test his knowledge of the subject, and particularly his ability to prepare exercises for teaching.

The candidate for a position as teacher in the Indian schools is examined in penmanship, orthography, pedagogy, arithmetic, geometry, geography, natural history, history and government of the United States, drawing, American literature, and physiology and hygiene.

Indian Teacher.

In pedagogy he is required to write an essay on some practical pedagogic question, such as: "The advantages and disadvantages of periodical written examinations in the intermediate grades of school work." (See *The Teacher*, in this GUIDE.)

In arithmetic, besides solving given problems, he is required to write his opinions upon some practical teaching point, as: "The proper method of teaching decimal fractions to children 9 to 12 years of age." (See *The Teacher*, and also references to Arithmetic, in this GUIDE.)

In geometry he is required to write an essay of 100 to 150 words, on some topic assigned. The following topic has been used: "The method to be pursued in teaching a knowledge of point, line, surface, and volume, to a class of pupils in the intermediate grade." (See Geometry, page 132, in this GUIDE.)

In geography, topics like the following are to be written upon: "What plan would you pursue in teaching young pupils a knowledge of the earth's motions and the location of the zones of climate?" (See the last of the *Courses of Reading in Geography*, in this GUIDE.)

In natural history, topics like the following have been used: "Your method of imparting to advanced classes a knowledge of the habits, characteristics, etc., of the family *Ovidæ* (sheep)." (See XXI. 784; XV. 432. Make use of the *Readings in Zoölogy*, in this GUIDE.)

In American history and government, the candidate is required to write an essay of 150 to 300 words on some such topic as this; "A description of the war of 1812, written in a manner to interest children." (See *The American Citizen*, also *Readings* in *History*, in this GUIDE.)

In American literature the following topic has been used: "A method of outlining and teaching a knowledge of American literature to advanced primary pupils." (See *Readings in Literature*, in this GUIDE.)

In physiology and hygiene, an essay is required on some such topic as this: "The anatomy, physiology, and hygiene of respiration, as you would explain them to a class of pupils in intermediate grades." (See Anatomy, I. 799–908; Physiology, XIX. 8–43; Hygiene, XII. 566, etc. Also *The Physician*, in this GUIDE.)

The candidate for a position as physician in the Indian service is examined specially in anatomy and physiology, in chemistry, materia medica, and therapeutics, in gen-

eral pathology and theory and practice of medicine, in surgery, in medical jurisprudence, toxicology, and hygiene, and in obstetrics. (See *The Physician*, in this GUIDE.)

Indian Physician.

Sample Questions: Describe the location and course of the popliteal artery. (I. 904.)

Give the origins and attachments of the biceps muscle. (I. 839.)

What is iron rust chemically? (XIII. 279.)

Give the differential diagnosis of rubeola and scarlatina. (XV. 657; XXI. 376; XVIII. 404.)

What is dysentery? (VII. 584.)

How may cicitrization be hastened after a burn in which the skin has been destroyed? (XXII. 680.)

Give the characteristic features of poisoning by phosphorus. (XIX. 279.)

The Industrial teacher and farmer in the Indian service must pass examination in penmanship, orthography, farm economy, keeping accounts, and practical farming. In farm economy he must answer five questions on the care and use of the more common tools, mechanical appliances, etc., connected with farm work. (See I. 311–328.) In practical farming he must answer five questions relative to general farming and gardening operations, care of live-stock, etc. (See the chapters in this GUIDE entitled, respectively, *The Farmer*, *The Gardener*, and *The Stock Raiser*.)

Indian Farmer.

II. THE CUSTOM-HOUSE SERVICE.

In the Custom-house service, examinations are held for clerks, law clerks, day and night inspectors, inspectresses, messengers, weighers, gaugers, examiners, and samplers. All are examined in orthography, copying, penmanship, and arithmetic.

Clerk. The candidate for clerk is examined specially in the Elements of the English language (VIII. 390, XVIII. 782, 787); in letter-writing (see *The Writer*, in this GUIDE); in the elements of geography (see *Readings in Geography*, in this GUIDE); and in the history and government of the United States (see *The American Citizen*, in this GUIDE.)

The candidate for customs law clerk is examined specially in the elements of the English language; in letter-writing; and in law questions. (See *The Lawyer*, in this GUIDE.)

Inspector. The candidate for inspector or inspectress is examined specially in the elements of the English language, and in the geography of America and Europe (see *Readings in Geography*, in this GUIDE).

Gauger. The candidate for gauger, examiner or sampler, must show his fitness for the position by answering practical and theoretical questions, and by performing practical tests in gauging, etc. See Custom-houses, VI. 729.

Gauging, XVI. 28.
Commerce, VI. 196, 203.
Tariff legislation, sup. 2853.
Imports and Exports, XVII. 247.

III. THE POST-OFFICE SERVICE.

See the follwing articles:
Post-office, XIX. 578, 579.
Postal service of the United States, sup. 2425.
Post-office Department, sup. 2428.
Free-delivery system, sup. 2426.
Universal Postal Union, sup. 2427.
The classified postal service embraces only clerks and

carriers. To test the fitness of a candidate for this service, examinations are provided, which include the following subjects: Orthography, copying, penmanship, arithmetic (fundamental rules, fractions, and percentage), elements of the geography of the United States, local delivery, reading addresses, and physical tests.

Letter Carriers.

See references relating to above subjects, already given for examinations for the departmental service, page 292.

IV. THE GOVERNMENT PRINTING SERVICE.

Candidates for any of the trades positions in this service must show that they have had five years' experience at the particular trade for which they desire to be examined. The examination embraces the following subjects: Orthography, penmanship, letter-writing, arithmetic, practical questions. (See remarks on the examination of clerk-copyist, page 292 of this GUIDE.) Under the head of practical questions, the candidate is required to perform four exercises:

Printers.

(1) Correcting proof—in the same manner as in ordinary proof in a printing-office (see sup. 2454; XXIII. 701).

(2) a. Writing from incorrect copy, correcting errors in syntax and orthography, and properly punctuating and capitalizing. This exercise is for book and newspaper printers only. (See *The Writer* in this GUIDE.)

(2) b. Arrangement of a title-page and a business card. The candidate is furnished with the matter, and he is required to arrange it properly, indicating the size of type in which each line should be printed. (See *The Printer*, in this GUIDE.) This exercise is for job printers only.

(3) Tabulating, or the proper arrangement of facts and figures in a table, with appropriate general heading and box-heads.

(4) Abbreviations. Writing out in full ten words for which the abbreviations on the sheet stand, and also giving the corresponding correct abbreviations for ten other words printed on the sheet. See I. 26; sup. 16, and sup. 23.)

V. THE INTERNAL REVENUE SERVICE.

The classified internal revenue service includes clerks, storekeepers, and gaugers employed in the collection of internal revenue. To test fitness for admission to this service, examinations of a practical character are provided on such subjects as the Commission may from time to time direct.

(See National Revenue, IX. 171. Also that part of the chapter entitled *The Banker and Financier*, in this GUIDE, which refers to public finances.)

B. THE SERVICE OF THE STATE.

State Laws.

Civil-service rules, similar to those in force in the executive department of the federal government, have been adopted in three states—in Massachusetts and Illinois by legislative enactment and in New York by constitutional amendment. As a general thing, the requirements, the questions, and the tests do not differ materially from those prescribed for candidates for similar posts of duty in the national service. In New York, nearly all the state offices below that of deputy and the officials whose relations to the head of the department are of a fiduciary character are placed on the competitive list. In the other States, the rules apply especially to the selection of employees in the cities which are included under the provisions of the civil-service law, and in a more limited manner to the appointment of sub-officials and assistants in the executive de-

partment of the Government. In Wisconsin, a legislative enactment provides for the application of civil-service rules in cities of the first class; but Milwaukee being the only city of that description, the law is inoperative elsewhere. Movements have already been inaugurated (December, 1896), for the introduction of civil-service bills in the legislatures of other States, as Pennsylvania, Maryland, Minnesota, and Colorado. It is therefore probable that, within a few years, civil-service rules will be in force quite generally in all the State governments.

C. MUNICIPAL SERVICE.

Cities having Civil Service.

Civil-service rules have been adopted and are now in effect in all the cities of New York and Massachusetts; in Chicago and Evanston, Illinois; in Milwaukee, Seattle, and New Orleans; and to a limited extent in Louisville, Kentucky, and Portland, Maine. Movements are on foot towards the adoption of such rules in many other cities, as St. Louis, San Francisco, Denver, Wheeling, and Galveston, Texas.

New York.

In New York City, only deputies, private secretaries, and the holders of a few important positions are excepted from the application of these rules. Indeed, in a total of nearly 15,000 positions, all but about 75 are subject to the regulations of civil-service laws.

Chicago.

Of the other cities in which the rules are now in force, Chicago and Boston may be selected as examples. In Chicago the classification includes the following divisions:

A. Medical service. (See *The Physician*, in this GUIDE.)

B. Civil engineering. (See *The Engineer*, in this GUIDE.)

C. Clerical service, comprising copyists, recorders, bookkeepers, stenographers, pages, messengers, etc.

D. Police service. (See *The Magistrate and Policeman*, in this GUIDE.)

E. Electrical service. (See *The Electrician*, in this GUIDE.)

F. Fire service.

G. Mechanical engineers—persons who require a knowledge of steam engines, boilers, and other machinery. (See *The Machinist*, and *Readings in Physics*, in this GUIDE.)

H. Bridge service.

I. Inspection service.

J. Janitor and Elevator service.

K. Library service. (See *The Bookman*, in this GUIDE.)

L. Labor and miscellaneous service.

In Boston the civil-service list includes nearly the same classes of workers. Here, besides (1) the clerical service, are (2) all persons doing police duty in prisons, reformatories and other public institutions of the State and city; (3) members of the fire department; (4) members of the police department doing permanent duty; (5) engineers and draw-tenders; (6) foremen and sub-foremen of laborers; (7) inspectors of work; (8) engineers and janitors employed in school buildings; (9) truant officers, and several others.

Boston.

The questions for examination in the various cities relate to about the same branches and are of about the same grade of difficulty as those used in examinations for the national service. A very few examples will be sufficient.

Candidates for health inspector are asked questions on contagious diseases (XVIII. 401); on fumigation and purification, deodorants and disinfectants (VII. 258; XII. 569, etc.).

Examinations.

Candidates for the similar position of medical inspector are supposed to be the possessors of medical diplomas, and to have had some experience in hospital practice. They may be asked to name all the infectious diseases that may become epidemic in certain localities; to describe bacteria (XXI. 398); to state methods for the suppression of tuberculosis (XVIII. 405, 855, etc.); to give the diagnosis and treatment of diphtheria, etc.

To such candidates, the references named in *The Physician*, in this GUIDE, will be of no little interest.

The candidate who aspires to the position of assistant engineer is examined, among other things, upon his knowledge of the various systems of sewerage (XXI. 711; IV. 467, etc.); of coffer dams (XXIV. 406); of the construction of pavements; of masonry, of piling (IV. 327), of waterworks, etc. (See the chapters in this GUIDE entitled *The Engineer* and *The Builder*.

Applicants for positions in the detective force of district police, besides being examined in writing and the elementary English branches, are asked questions relative to crime, detection of criminals, legal papers, and methods of procedure in criminal cases. (See the references in the chapter, in this GUIDE, entitled *The Magistrate* and *Policeman*.)

Men wishing to be employed as drivers in the fire service or other service of the city, may be examined as to their knowledge concerning the proper care of horses, the diseases of horses, the shoeing of horses, etc. (See references in the chapter entitled *The Stock Raiser*.)

Candidates for positions in the public libraries are examined upon their acquaintance with general literature and periodical literature, and their general knowledge of books. (See in this GUIDE, *Five Courses of Reading in Literature*, and *The Bookman*.)

LIBRARY OF THE UNIVERSITY OF

The limits assigned to this chapter forbid any further details concerning the requirements and examinations for the numerous positions procured only through competitive examination in the cities we have mentioned. Enough has been said to point out the way whereby the candidate for a position in any department of the civil service may so utilize the vast store of information in the *Encyclopædia Britannica* as to make it a convenient and useful aid in his efforts to prepare himself for the ordeal of examination, no matter in what branch or under what division of the service.

CHAPTER XLIV.

THE POLITICAL ECONOMIST.

"This is that noble Science of Politics, which is equally removed from the barren theories of utilitarian sophists, and from the petty craft, so often mistaken for statesmanship by minds grown narrow in habits of intrigue, jobbing, and official etiquette—which, of all sciences is the most important to the welfare of nations—which, of all sciences, most tends to expand and invigorate the mind—which draws nutriment and ornament from every part of philosophy and literature, and dispenses in return nutriment and ornament to all."—*Macaulay.*

Political Economy.

POLITICAL ECONOMY, in its historical aspects, is the subject of an important article by J. K. Ingram, in the nineteenth volume of the *Encyclopædia Britannica.* The earliest expressions of thought on economic subjects have come down to us from the Oriental theocracies, and of these Mr. Ingram gives an interesting account in XIX. 348. This is followed by a survey of Greek and Roman notions of economics, with quite a full exposition of Plato's ideal system.

The economy of the Middle Ages is described at length (pages 353–355), with some notice of the origin of trade corporations, and their influence upon the industrial forces of those early times. The three successive phases of modern economics are then treated with great fulness (pages 352–401). This latter and larger part of Mr. Ingram's article may be read by sections, with collateral references to other articles, as follows:

First Modern Phase—Transitional, XIX. 354.

Second Modern Phase—Mercantile, XIX. 354–358; Co-

pernicus, VI. 346; Sir William Temple, XXIII. 171; John Locke, XIV. 751.

Third Modern Phase—Natural Liberty, XIX. 358–401.

1. WEALTH AND CURRENCY. Adam Smith, XXII. 169; his "Wealth of Nations," 364–370.

Wealth in economics, XXIV. 461.

Capital, V. 71.

Money, XVI. 720; depreciation of currency, IX. 178.

Bullion, IV. 518, 519.

Exchange, VIII. 784–796.

Silver, XXII. 69–74.

Coinage Laws, sup. 857.

Crime of 1873, sup. 904.

Finances of the United States, sup. 1257.

Jeremy Bentham, III. 575.

Locke on money, XIV. 754; Ricardo on money, XX. 534. (See references to money in the chapter entitled, *The Banker and Financier.*)

2. BANKS AND BANKING. (See especially the chapter in this GUIDE entitled, *The Banker and Financier.*) Savings-banks, XXI. 327.

3. POPULATION. Population considered in its statical and dynamical aspects, XIX. 513.

The Malthusian theory, 371; Thomas Malthus, XV. 343.

Immigration into the United States, sup. 1657.

4. TAXATION. See the special article on taxation, XXIII. 85.

Ricardo, XX. 533.

Taxation and protection, IX. 755.

Henry George, sup. 1381.
Income tax, sup. 1662.
Inheritance tax, sup. 1681.
Single tax, sup. 2725.
(See other references, page 319.)

5. PAUPERISM. See POOR-LAWS, XIX. 462.
Robert Owen, XVIII. 86.
English Poor-law Parish, XVIII. 296.
Poor-law Relief, XIX. 468, 473.
English Charities, V. 401.
See *The Philanthropist and Reformer*, in this GUIDE.)

6. LABOR AND WAGES. Special article on Labor, XIV. 165; special article on Wages, XXIV. 307.
Lassalle, XIV. 321.
Industrial Condition of Women, sup. 1672.
Apprenticeship, I. 213.
Guilds, XI. 259.
(See the chapter in this GUIDE entitled, *The Laborer.*)

7. COÖPERATION. Communism, VI. 211, Socialism, XXII. 205; Coöperation, V. 338.
Oneida Community, XVII. 773.
Amish or Ammonite Community, sup. 169.
Brook Farm Association for education and agriculture, XX. 567.
The Community at Economy, sup. 1113.
Shakers, XXI. 736.
Fourier, IX. 489.
Saint-Simon, XXI. 197.
Robert Owen, XVIII. 86.
Plato's Republic, VI. 212.
Sociological conceptions of Comté, VI. 235.

Modern Clubs, VI. 41.
Anti-Poverty Society, sup. 1381.

8. TARIFF. See the special article, Free Trade and Protection, IX. 752.
Custom duties, VI. 729.
Protection, sup. 2461.
Tariff, sup. 2853.
Warehousing, sup. 3084.

9. POLITICAL ECONOMISTS. A few famous economists not named above:
John Stuart Mill, XVI. 307.
J. E. Cairnes, IV. 643.
Walter Bagehot, XIX. 396.
Arnold Toynbee, XIX. 397.
Benjamin Franklin, IX. 711.
Harriet Martineau, XV. 583.
Nassau Senior, XXI. 663.
Edward Atkinson, sup. 280.
Henry C. Carey, sup. 698.
For further references, see the chapter entitled, *The American Citizen.*

CHAPTER XLV.

THE BANKER AND FINANCIER.

"Seest thou a man diligent in business? He shall stand before kings."—*Proverbs of Solomon.*

IN this chapter it is proposed to point out a few of the articles in the *Britannica* which relate to the kindred topics, money and banking, with a brief notice of national finance.

I. MONEY.

In the earliest ages of the world all business was carried on, and all man's needs were satisfied, by trading or barter.

The First Money.

The man who had wheat and wanted beef had to find some one who had a cow and was willing to exchange her for his grain. See VI. 196.

But this method was so inconvenient that men finally began to try to find something that would serve as a medium of exchange. Different races, peoples, and tribes tried different mediums.

The Greeks used cattle, VI. 197;

The Chinese used tea, XVI. 723;

Salt was used in some countries, XVI. 723;

Tobacco was used by the colonists of Virginia, XXIII. 729; the Indians used wampum, sup. 3078.

Cowry shells were used in some maritime countries, VI. 535, 766;

And in other countries various other articles were used, XVI. 723.

But whatever the article may have been, it was money, and was so called. Why? What is money? See XVI. 720. What are the causes which determine the value of money? See XVI. 721.

Why were these ancient forms of money unsatisfactory? Why were metals preferable, and when were they first used for money? See XVI. 723.

Why was iron unsatisfactory?

Why were silver and gold finally selected? What are the special advantages of these two metals? See XVI. 723, 724.

What is coinage? See XVI. 724; sup. 856.

Coins.

The science of coins is called Numismatics. See the long and very interesting article on this subject, XVII. 628–661. Here under distinct headings are chapters on the history of Greek coins (page 631); of Roman coins (page 652); of mediæval and modern coins (page 654); and of Oriental coins (page 659). See Coins of the United States, sup. 857.

Standards.

The substance to be used in coinage being determined upon, the next thing was to select a standard unit of value. Every country naturally fixed upon a standard of its own. In England this standard is the *pound;* in France it is the *franc.* See XVI. 730. In the United States it is the *dollar.* See sup. 856.

What are the standards of other countries? And what are the principal gold and silver coins used in all the countries of the world? See XVI. 732, 733.

How are coins made? A complete description of the processes employed in the making of gold and silver coins may be found in the article entitled Mints, XVI. 480–490.

In this article there is also a concise and very interesting history of the methods of coinage among all nations from the earliest stages of civilizations to the present time. See United States Mint, sup. 2075.

Mints.

Since the coins of a country consist of two metals, gold and silver, how shall the ratio of one to the other be fixed?

In other words, of how much more value is a certain quantity of gold, by weight, than an equal quantity of silver? This brings us to a consideration of the relative values of the two metals. Read what is said about the conflict of standards, XVI. 735–738, which you will find to be a masterly presentation of the whole subject.

In the United States, the first Congress fixed the ratio at 15 to 1; that is, it was decided that fifteen pounds of silver should be considered worth as much as one pound of gold. A complete history of the coinage laws of this country since that time, written by Senator John Sherman, may be found in sup. 856. Used as money, gold has some advantages which silver has not, and silver has some advantages which gold has not. This matter is carefully discussed in XVI. 723.

Sixteen to One.

The reader of Senator Sherman's article will find that the ratio of the two metals did not long remain at 15 to 1. Silver becoming more and more plentiful all the time, it followed the inevitable law of demand and supply, and became cheaper and cheaper until finally it took 16 ounces of silver to buy one ounce of gold.

Did the ratio stay at 16 to 1? It would have done so if silver had not continued to become more and more plentiful. This whole question is ably discussed in XVI. 736–737, and in Senator Sherman's article. See also the "Crime of 1873," sup. 942.

As to the relative increase in the world's annual product of gold and silver, see XVI. 731, 735; XXII. 73. Read also the article on Bullion, IV. 518, and the chapter on the economic production of the precious metals, XVI. 728–730. See also the account of the Monetary Conference of 1892, sup. 2994.

II. BANKING.

In its simplest form, a bank is an institution where money may be deposited for safe-keeping. See the history of the origin of banking, II. 316, 317.

Banks.

But banks usually lend money as well as receive it; and their profits accrue from the excess of the interest received over that which is paid out. See the following articles:

Interest, XIII. 188.
Interest in the United States, sup. 1685.
How interest is calculated, II. 536.
Usury, XXIV. 17.
American law on usury, sup. 1686.

When money is deposited in a bank on a current or drawing account, the customer may draw it out, as he requires, by means of orders called cheques. See Cheques, V. 583.

Bankers also undertake the business of collecting money for cheques, for bills, and for other securities, which they may have received from their customers. The labor of collection is much facilitated by means of bills of exchange. See the following articles:

Exchange.

Exchange, VIII. 784.
Bills of exchange, III. 673.
Rates of exchange, XXIV. 52.
Interest on bills of exchange, VIII. 791.

In England, bills of exchange are made payable in

London. In the United States every country banker has a correspondent in one of the banks of New York. The common centre of exchange, established by the bankers of these cities to further facilitate this branch of their business, is called a clearing-house. See the following:

Clearing-house.

Clearing-house, III. 328.
London Bank Clearing-house, I. 91.
Clearing-house in New York, etc., sup. 826.
Clearing-house certificates, sup. 827.

Modern banking originated with the money-dealers of Florence, Italy, as early as the 11th century. See IX. 334.

It was introduced into England by the goldsmiths of London, in the 17th century. See Bank of England, III. 316–319.

A history of banking in the United States is given in a very ably written article in sup. 337. Another article on the same subject, giving an account of the rise of state banks and their transformation into national banks, is found in III. 339–341. Still other interesting historical information upon this subject is given in XXIII. 766, 776. See also:

United States Currency.

Paper currency in the United States, XXIII. 775.
Greenbacks, XXIII. 775.
Bank-notes, sup. 341.
Legal tender, sup. 1858.
Banking system of the United States, III. 203.
Greenback Party, sup. 1461.

With the development of commerce and the increase of exchange, the business of banking has been variously subdivided. The different classes of bankers are distinguished from one another by differences in the rules which they observe in the management of their business. Hence arise the different classes of banks.

Classes of Banks.

(1) Banks of deposit, III. 328. The article on bank vaults, sup 344, is an interesting description of the latest improved burglar-proof vaults.

(2) Land-mortgage banks, III. 328. See, also, XVI. 848; XXIII. 596. Mortgage on land, XIV. 265, 270.

(3) Credit companies, or credit banks: In Germany, VI. 214, 339. Crédit Foncier and Crédit Mobilier, VI. 557.

(5) Discount banks, III. 328. See also Brokers, V. 360; Brokers in America, sup. 581; accommodation paper, sup. 36.

(5) Banks of issue—national banks (sup. 338), state banks, etc. See bank-notes, sup. 341; United States Bank, sup. 3001; Banking system of the United States, III. 203; Bank-note manufacture, sup. 341.

(6) Savings-banks, XXI. 327.

Post-office savings-banks, XIX. 572.

Savings-banks in the United States, sup. 2636.

Law of savings-banks, sup. 2637.

In order that the genuineness of the coins of a government or of its paper currency may be preserved, stringent laws have been passed in most countries for the prevention of counterfeiting and the punishment of counterfeiters. See sup. 928.

Stock Exchange.

The influence of the Stock Exchange upon the financial stability of the country will be better understood after reading the article on Stock Exchange in XXII. 556. See also Account, I. 91; bulls and bears, I. 92.

For accounts of the great financial crises that have occurred at various times, see Banking, III. 319; sup. 339, 340; and Panics, sup. 2288.

Famous Bankers.

Some of the most famous bankers of the world deserve to be noticed here. A study of the methods by which they acquired preëminence and boundless fortunes may help to a clearer understanding of the business principles that are at the basis of success in every enterprise.

The greatest banking and mercantile houses in Europe in the 14th century were the Bardi and Peruzzi of Florence. See III. 316.

William Paterson was the chief projector of the Bank of England, XVIII. 359.

The Rothschilds have long been known as the greatest family of bankers in the world, XXI. 3; sup. 2580.

An American banker, whose name should always be mentioned with reverence, because of his great services to our country, was Robert Morris of Pennsylvania, XVI. 846.

Other famous bankers and financiers might be named, such as:

Baroness Burdett-Coutts, sup. 624.
Lyman J. Gage, sup. 1356.
Hetty R. Green, sup. 1459.
Baron Hirsch, the Jewish philanthropist, sup. 1588.

In connection with these studies, see also:
Pawnbroking, sup. 2327.
Pledge, XIX. 220.
Broker, V. 360.
Safe-deposit Companies, sup. 2599.
Payments, XVIII. 441.
Legal Tender, sup. 1858.

III. PUBLIC FINANCE.

In Great Britain, the Bank of England transacts the whole business of government. "She acts not only," says

Adam Smith, "as an ordinary bank, but as a great engine of state. She receives and pays the greater part of the annuities (see II. 72) which are due to the creditors of the public; she circulates exchequer bills (see IX. 182; XI. 386); and she advances to the Government the annual amount of the land and malt taxes which are frequently not paid till some years after." This bank, therefore, occupies a place of very great importance in the finance of Great Britain.

Bank of England.

But before going further, let us define finance. By the finances of a country we generally understand the ways and means by which the expenditures of government, local and national, are met. Under this head, therefore, all methods of taxation are to be considered.

History of Finance.

The most ancient forms of finance were taxes on produce, IX. 171. See

Taxation in Athens, IX. 172; in Rome, IX. 173.
English exchequer, VIII. 297; history of, IX. 174.
Finance a science in England, IX. 180.
Land taxes in England, IX. 181, 182.
Taxation of the American Colonies, IX. 185, 186.
The English Stamp Act, VIII. 357; XXIII. 737.
Income tax in Great Britain, IX. 187–189.
Tariff legislation, sup. 2853.
The corn laws, IX. 189, VI. 408; their repeal, VI. 84, XVIII. 457.

Notorious financial schemes: South Sea scheme, IX. 183; John Law's Mississippi scheme, XIV. 367, IX. 584, XV. 22; schemes of Baron von Goertz, sup. 1415.

History of taxation in England, IX. 174–191.

After having read the foregoing articles, we are prepared for the article on TAXATION, XXIII. 85, where we

shall find an analysis of the economical theory in accordance with which taxation is shown to be just and equitable, or unjust and oppressive. Here, also, are considered the various species of taxes:

Taxation.

Direct taxes, and indirect, XXIII. 87.

Taxes on rent, XXIII. 87.

Taxes on profits, XXIII. 87.

Taxes on capital, XXIII. 88; see, also, Pitt's income tax, IX. 187; income tax in the United States, sup. 1662.

Taxes on wages, XXIII. 89; see Wages, XXIV. 306.

Tax sales, sup. 2858.

Taxes on commodities, XXIII. 89. This leads us to a consideration of export and import duties. Read, therefore, the article on FREE TRADE, IX. 752–762—a masterly presentation of the whole question as viewed from a British standpoint. Then follow with

Taxation and protection, IX. 755.

Protection in the United States, XXIII. 754, 761, 776, sup. 2461.

Warehousing, sup. 3084.

History of tariff laws, sup. 2853.

Finances of the United States, sup. 1267.

Treasury Department of the United States, sup. 2937.

The monetary problem, sup. 2997.

The other side of this subject of public finance relates to expenditures and the national debt. A number of valuable articles are presented for consideration:

National Debt.

National debt, XVII. 243.

Debt of the United States, XXIII. 747; sup. 1005.

Receipts and expenditures of the United States, sup. 2986.

Debts of various nations, sup. 1007.

CHAPTER XLVI.

THE MERCHANT AND TRADER.

"I will buy with you, sell with you."—*Merchant of Venice.*

"Many times the reading of a book has made the fortune of a man—has decided his way of life."—*R. W. Emerson.*

COMMERCE, in its broadest signification, is traffic in goods. This traffic may be on a large scale or a small scale; it may be conducted entirely within one's own country or it may extend to foreign lands. To the merchant who is engaged in such traffic, the *Encyclopædia Britannica* affords information which it would be difficult for him to obtain from any other source. In the first place, there is no commodity in which he deals that it does not fully describe. If his specialty is dry goods, he has but to turn to the *Britannica* to learn all about silk, XXII. 56; satin, XXIV. 464; calico, VI. 488; gingham, X. 604; woolens, XXIV. 653; thread, VI. 502; and the hundreds of other articles on his shelves. If he is a grocer, he may learn with equal facility all about coffee, VI. 110; tea, XXIII. 97; spices, XIX. 97; sugar, XX. 622; and the numberless commodities of his trade. And so, no matter what department of merchandise may be his, he will find that the pages of the *Britannica* are teeming with information for him. It is unnecessary for the GUIDE to specify further in this direction. Any desired article having reference to the various kinds of merchandise may be readily found by consulting the Index volume. It is rather with the general features

Dry Goods.

Groceries.

of trading or of commerce that we propose to deal in this chapter.

History of Commerce.

Every merchant (and thousands of people who are not merchants) will be attracted by the very interesting article on COMMERCE in the sixth volume of the *Britannica*. This article is largely historical in character, and embraces, among other topics, the following :

Antiquity of commerce, p. 196.

Free trade in Great Britain, p. 205.

Tariffs, p. 203.

Increase of International trade, p. 203.

Now, as to the antiquity and history of commerce, we may learn still more by referring to the chapter on commerce and industry, VIII. 617, and to sections relating to trade under the heads of Arabia, Phœnicia, etc.

Free Trade.

For additional information concerning free trade and tariffs, together with a full discussion of the questions relating to them, see the following articles :

FREE TRADE, IX. 752.

Customs duties, VI. 729.

United States tariff legislation, sup. 2461, 2853.

Economic System of Free Trade, IX. 721 ; Colonial System, sup. 868.

For the history and present status of international trade, see the section relating to trade under the head of each country. For example ;

Trade of Algeria, I. 565.

Trade of Arabia, II. 245.

Trade of Argentina, II. 495.

Trade of Austria, III. 121, etc.

See, also, Imports and Exports, XVII. 247.

Foreign Commerce of the United States, sup. 2998.

Reciprocity and retaliation, sup. 2998.

In any system of commerce the question of transportation is an important factor. This is clearly illustrated in the chapter relating to defective conditions of commerce in the ancient world, VI. 198.

Transportation.

Transportation by means of camels in caravans (V. 83) is the most ancient method known to us. Transportation by boats, along rivers and the shores of inland gulfs and seas, dates also from a very early period (XXI. 804). See such articles as

Ships.

Ancient and mediæval ships, XXI. 804.

Modern ships, XXI. 809.

Shipping of the United States, XXIII. 826.

Whaleback steamers, sup. 3132.

Notice the references in the chapter entitled, *The Seaman*, in this GUIDE.

Water transportation in modern times has been vastly facilitated by artificial water-ways called canals. The *Britannica* contains a variety of chapters relative to these highways of trade.

Canals.

Canals, a historical and descriptive article, IV. 782.

Ship canals, IV. 787.

History of canals and canal-construction—a valuable article, fully up to date, sup. 677–683.

The Panama Canal, XVIII. 209; sup. 2286.

The Nicaragua Canal, XVII. 1136; sup. 2208.

The Suez Canal, XXII. 620.

The St. Lawrence Canal, XXI. 179.

The Erie Canal, sup. 1213.

Statistics of canals in the United States, sup. 683.

Shipping, United States laws, sup. 2706.

Shipping on the Great Lakes, sup. 2707.

Commerce on Deep Waterways, sup. 3103.

But by far the most important method of transportation is that by railroads; and here we must refer the reader to the chapter in this GUIDE entitled, *The Railroad Man.*

Railroads.

In connection with this same topic of transportation, there are certain related subjects which are of practical interest to the trader or merchant. We mention only a few:

Carrier, V. 138.

Common carrier (in the United States) and his liabilities, sup. 709

Charter-party, shipping contract, V. 433.

Freight and freight-carriers, sup. 1338.

Grain elevators, sup. 1436.

Bill of lading, III. 674; sup. 470.

TOPICS OF TRADE.

Other subjects of a more or less practical character are constantly claiming the attention of every man of business. The *Encyclopædia Britannica* discusses all of these subjects in a lucid and comprehensive manner, thus answering many difficult questions, and giving much information that cannot be found elsewhere. Here are some of the topics:

Account, I. 91; sup. 36.

Adjustment, I. 154.

Agent, I. 280.

Arbitrage, II. 311.

Average, III. 145.

Bill of credit, sup. 470.

Bill of exchange, sup. 470.

Bill of sale, III. 674.

Company, VI. 221.

Contraband, VI. 320.

Exchange, VIII. 783.

Excise, VIII. 797.

Insurance, XIII. 161. (See the chapter in this GUIDE entitled, *The Insurance Agent.*)

Partnership, sup. 2303.

Trade-marks, XXIII. 498; sup. 2321.

Corn trade, VI. 413.

Cotton trade, VI. 487.

Silk trade, XXII. 64.

Chambers of Commerce, sup. 743.

Commercial Law, sup. 876.

Commercial Museum of Philadelphia, sup. 876.

Trusts, sup. 2952; XXIII. 600.

Business Colleges, sup. 635.

Mercantile Agency, sup. 2037.

Mercantile Law, sup. 2038.

Laws affecting merchant seamen, XXI. 650.

Trade-unions, XXIII. 499.

Money. History of money, VI. 196; cowry shells used for money, VI. 535. (See the chapter in this GUIDE entitled, *The Banker and Financier.*)

FAMOUS MERCHANTS.

The following subjects are also of more than passing interest to persons engaged in mercantile pursuits:

Merchants of the Steelyard, London, XXII. 528.

The Company of Merchant adventurers, XXI. 826.

South Sea Company, VI. 221.

John Law and the Mississippi scheme, IX. 584; XIV. 367.

Hudson's Bay Company, XII. 333.

East India Company, II. 701; sup. 1107; X. 185, 186.

Dutch East India Company, X. 186.

For reading in leisure hours, there are few subjects more interesting than the lives of famous men who have

achieved success in their respective callings. There have been many great merchants whose biographies are well worth perusal. Read the accounts given in the *Britannica*, of

Leisure Reading.

Sir Richard Whittington, "thrice lord mayor of London," XXIV. 555.

Sir Thomas Gresham, founder of the Royal Exchange, XI. 186.

John Jacob Astor, the great fur merchant of America, II. 737.

Stephen Girard, the merchant philanthropist of Philadelphia, X. 621.

Robert Morris, the American patriot, XVI. 846.

George Peabody, merchant and philanthropist, XVIII. 442.



CHAPTER XLVII.

THE INSURANCE AGENT.

"He commands us to provide and give great gifts."—*Timon of Athens.*

INSURANCE is the term applied to any organized method of providing against pecuniary losses from fire, shipwreck, accidents to the person, or premature death. Insurance is usually conducted by a company or corporation having ample means, which guarantees the insured, under certain conditions and to a specified extent, against loss from one or the other of these contingencies. The business of insurance is very extensive, employing a vast amount of capital and engaging the services of great numbers of men in every civilized country in the world. It is evident that to be a successful manager, or agent in any capacity, for an insurance company, a person must not only possess a fair business education, but he must know a good deal about the history, the objects, and the internal methods and economy of the special business in which he proposes to engage. No other single publication in the world contains more well-digested information on these subjects than is to be found in the *Encyclopædia Britannica.*

Definition.

A general history of insurance in its different branches is contained in the article INSURANCE, XIII. 161–187.

Other topics with which every manager or agent will wish to make himself acquainted, are as follows:

Company, VI. 221; XVIII. 330.

Corporation, VI. 432.
Corporations in the United States, XXIII. 785.

General Topics.

Contracts, VI. 322; XXI. 305.
Partnership contracts, XVIII. 330.
Interest, XIII. 188; calculation of, II. 536.
Premium, XIII. 162.
Commission, II. 536.
Warranty, XXIV. 373.
Assignment, II. 729.

FIRE INSURANCE, XIII. 161–168.

Fire.

Fire Insurance in the United States, sup. 1276.
Fire Insurance in Great Britain, XIII. 164.
Insurance companies in Canada, XIII. 168.
National Board of Underwriters in the United States, XIII. 168.

MARINE INSURANCE, XIII. 184–187.

Marine.

History of marine insurance, III. 145.
Marine Insurance in the United States, sup. 1995.
Average in maritime commerce, III. 145.
Average in marine insurance, XIII. 187.
Lloyd's marine insurance, XIV. 741.

LIFE INSURANCE, XIII. 168–184.

Life.

Life Insurance in the United States, sup. 1879.
Annuities, II. 72.
Endowments, XIII. 168.
Expectation, or mathematical probability, XIX. 775.
Longevity, XIV. 857.
Tables of mortality, XIII. 169.
Average death-rate in different countries, XIX. 517.

Causes of death, XVII. 686.
As to suicide, XIII. 179; XXII. 629.
The bonus system, XIII. 178.
The Tontine system, XIII. 183; IX. 181.
Lorenzo Tonti, XXIII. 444.
Non-forfeiture laws in the United States, XIII. 182.

ACCIDENT OR CASUALTY INSURANCE, XIII. 161.
Accident Insurance in the United States, sup. 34.
Minor forms of insurance, XIII. 161.

Societies.

Friendly Societies, IX. 780.
Coöperation, V. 338.
Mutual benefit orders, IX. 782.
Collecting societies, IX. 783.
Mutual Benefit Societies in the United States, sup. 417.
Fraternal societies, sup. 418.
Oddfellows, XVII. 723; sup. 417.
Order of Foresters, IX. 782; sup. 418.

See also, in this GUIDE, the chapters entitled, *The Mechanic*, *The Banker and The Financier*, and *The Lawyer*.

CHAPTER XLVIII.

THE LAWYER.

"Points more than all the lawyers in Bohemia can learnedly handle."
—*A Winter's Tale.*

WHO is there who does not need to know something about law? It is, of course, not to be presumed that every man can be his own lawyer, for there are times when the advice and assistance of trained members of the legal profession are indispensable. Nevertheless, there are certain legal terms and processes with which every person ought to be familiar. Questions are constantly arising concerning various matters connected with the operation and enforcement of the laws, and it frequently happens that much depends upon one's ability to answer these questions readily and correctly. You might not deem it worth your while to consult a professional lawyer about such matters, and yet if you should have a book at hand to which you could turn at once for the desired information, you would not remain in ignorance concerning them.

A Law Library.

The man who has a law library, however small, has oftentimes no little advantage over the man who has neither the library nor the legal education. The *Encyclopædia Britannica* is itself, within certain limits, an extensive library of legal lore, wherein every important subject connected with this branch of knowledge receives appropriate attention. To the man of business it is better than a law library, because he can refer to it so much more readily. Then, too, its

articles have none of that redundant verbiage which so often makes the ordinary law-book so tiresome and unsatisfactory. They crystallize the topics; they show the gift of brilliant minds in making principles clear above everything else.

Law Students.

To the young man who is desirous of following the profession of law as the business of his life, these articles are worth many times the entire cost of a set of the *Britannica*. The student who makes himself thoroughly familiar with all these articles in their proper sequence, will know more law than many a graduate from our law colleges. Almost any man of intelligence, by following the courses of reading here indicated, may lay the foundations for a successful legal career.

I. INTRODUCTORY.

Read the special article on Legal Education, sup. 1856. Then keeping well in mind the points therein mentioned, study the article on Law, XIV. 354, which is of itself "as good as a condensed Blackstone."

Then read, as occasion may permit, the following articles or parts of articles:

The origin of law, VIII. 624.
Plato on law, XIX. 210.
Roman schools of law, XIV. 164.
Roman law, XX. 669.

Codes.

Justinian's codification, XIII. 792; VI. 105; XX. 712.
Early English law, VIII. 276.
Administration of law in England, VIII. 261.
English codes of law, VI. 104.
Codes of Roman law, XX. 710.
Code of Napoleon, IX. 614; XVII. 205.
Inns of Court, XIII. 87.

Jurisprudence, XIV. 354.

II. LAWS IN HISTORY.

Laws of Moses, III. 634; XVI. 860; XIII. 397.
Laws of Confucius, VI. 258.
Laws of Mohammed, XVI. 591, 594.
Laws of Lycurgus, XXII. 370.
Agrarian laws, I. 287.
Salic laws, XXI. 212.
Brehon laws, IV. 252; XIII. 218.
American blue laws, sup. 504.

III. GREAT LAWGIVERS AND LAWYERS.

Biographies.

Moses, XVI. 860; XIII. 397.
Confucius, VI. 258.
Buddha, IV. 424.
Mohammed, XVI. 545.
Zoroaster, XXIV. 822.

Lycurgus, XV. 95.
Solon, XXII. 353.
Justinian, XIII. 792.
Alfred the Great, I. 506.

Savigny, XXI. 326.
Thibaut, XXIII. 300.
Zachariæ, XXIV. 762.
Grotius, XI. 217.
Vico, XXIV. 211.

Sir Edward Coke, VI. 119.
Sir William Blackstone, III. 800.
Sir John Fortescue, IX. 420.
Daniel Webster, XXIV. 417.

IV. GENERAL BRANCHES OF LAW.

Common Law, VI. 208.
Constitutional law, VI. 309.
Criminal law, VI. 587; IX. 124.
Canon law, V. 15; XIX. 499; V. 551.
Ecclesistical law, VII. 627.
Military law, XVI. 295; IV. 587.
Martial law, VI. 517.
Mercantile law, sup. 2038.
Maritime law, XXI. 589.
International law, XIII. 190; X. 161; XII. 152.
Foreign laws, sup. 1309.

V. SPECIAL LAWS OR CLASSES OF LAWS.

Laws of agriculture, I. 298.
Laws relating to the tenure of land, XIV. 259; I. 406.
Homestead laws of the United States, XII. 123.
Landlord and tenant, XIV. 272.
Leases, I. 341.
Laws concerning real estate, XX. 304.
Law of fences in the United States, sup. 1257.
Law of domicile, sup. 1687.

Laws concerning husband and wife, XII. 400; sup. 1998.
Marriage laws, XV. 565.
Marriage laws in the United States, sup. 1998.
Laws of divorce in the United States, sup. 1055.
Laws relating to women, XXIV. 637.
Laws regarding infants, XIII. 1.

Laws concerning personal estate, XVIII. 664.
Exemption laws of the United States, sup. 1228.
Laws of intestacy, XIII. 197.

Laws relating to wills, XXIV. 570.
Laws of primogeniture, XIII. 733.
Partnership laws, XVII. 329; sup. 2303.
Bankrupt laws, III. 341–345; sup. 342.

Labor laws, sup. 1198; XIV. 165.
Factory laws in the United States, sup. 1234.
Factory laws, VIII. 844.
Laws of apprenticeship, I. 212.
Corporation laws, VI. 432.
Port laws, XIII. 462.
Press laws, XIII. 710.
Corn laws, VI. 408.
Corn laws in the United States, VI. 413.
Election laws in the United States, sup. 1130.
Elections, VIII. 2.
Ballot—Australian ballot laws, III. 288.

Laws relating to public health, XX. 96.
Public health laws in the United States, XV. 798.
Lunacy laws, XV. 798.
Quarantine laws, XX. 153.
Burial acts, IV. 537.
Medical laws, XV. 798.

Liquor laws, XIV. 688.
Liquor laws of the United States, sup. 1892.
Sumptuary laws, XXII. 643.

The Army Act, XVI. 297.
Riot laws, XX. 564.
Laws of treason, XXIII. 525–530.
Pension laws of the United States, sup. 2344.
Passport laws, XVIII. 344.
Passport laws of the United States, sup. 2307.

Patent laws, XVIII. 354; of the United States, sup. 2320.
Copyright laws, VI. 356.
Copyright laws of the United States, VI. 365.
Recent revision of copyright laws, sup. 913.
English laws of copyright, XIV. 546.
International copyright, I. 720.

Municipal laws, VI. 435.
Riparian laws, XX. 265.
Sea laws, XXI. 589.
Fishery laws, sup. 1281.
Game laws, X. 61; of the United States, sup. 1362.

Laws of the road, sup. 2555.
Laws of auctions, III. 68.
Laws relating to gambling, X. 66.
Laws relating to lotteries, XV. 11.
Laws relating to travelers, sup. 2936.
For additional references, see the chapter in this GUIDE entitled, *The American Citizen.*

VI. ADMINISTRATION OF JUSTICE.

Administration of justice in primitive communities, VIII. 624.
Judicial combat, VII. 511; XVII. 820.
Areopagus, II. 481.

Courts.

Supreme Court of the United States, II. 210; XIII. 789; sup. 2824.
Judicial courts, VI. 516.
Courts of the United States, sup. 930.
Federal courts of the United States, XXIII. 750.
United States court of claims, sup. 814.
Court of private land claims, sup. 930.

Courts of appeal, II. 209; VI. 516; XIII. 765.
Criminal courts, VI. 516.
Justices' courts, XXII. 641.

English courts of justice, VIII. 261; XX. 311.
Quarter sessions, XX. 159.
Courts of summary jurisdiction, XXII. 641.
High court of justiciary, XII. 790.
Courts of oyer and terminer, XVIII. 106.
Courts of chancery, V. 389; XX. 311.
High court of admiralty, I. 158.
Vice-admiralty courts, I. 160; XXI. 607.

Officers.

Judge, XIII. 762.
Prerogatives of judges, XIX. 673.
Judicial costume, VI. 376.
Justice of the peace, XXIII. 789.

Grand jury, sup. 1439.
Trial by jury, VIII. 298; XIII. 783; XXIII. 555.
Trial by court-martial, VI. 517.
Contempt of court, VI. 318.

Barristers, III. 344.
Attorney, III. 52; sup. 284.
Sheriff, XXI. 800; VI. 513.
Constable, VI. 294; sup. 899.
Advocates' Faculty in Scotland, sup. 53.

For additional references, see the chapter in this GUIDE entitled, *The Magistrate and the Policeman.*

VII. LAW TERMS AND LEGAL PROCESSES.

The following is a partial list of LAW TERMS and legal processes explained in the *Britannica*, to which it may be necessary at some time to refer.

Abatement, I. 5; sup. 10.
Abduction, I. 31.
Abettor, I. 48.
Abeyance, I. 48; sup. 27.
Abstract of title, sup. 30. See, also, Con-
Law Terms, etc. veyancing.
Acceptance, I. 82.
Accession, I. 83.
Accessory, I. 83.
Accident in law, sup. 33.
Accomplice, sup. 36.
Accord and satisfaction, sup. 36.
Acknowledgment, sup. 39.
Acquittal, sup. 40.
Act of God, sup. 41.
Ademption, sup. 47.
Action, I. 132; sup. 41.
Adjudication, I. 154.
Administrator, I. 154; sup. 50.
Adoption, I. 163.
Adulteration, I. 167.
Adultery, I. 177; sup. 51.
Advancement, sup. 51.
Advocate, I. 178.
Advowson, I. 179.
Affidavit, I. 226; sup. 57.
Affinity, I. 226.
Age, Legal, sup. 84; of Consent, sup. 84.
Agent, I. 280.
Agistment, I. 283.
Agreement, sup. 86.
Agnates, I. 283.
Aiding and abetting, sup. 102.
Alias, I. 574.

Alibi, I. 574; sup. 126.
Alien, I. 574.
Aliment, I. 576.
Alimony, I. 576; sup. 127.
Allodium, I. 576.
Amendment, sup. 152.
Annuities, II. 72.
Appeal, II. 208; sup. 206.
Apportionment, sup. 209.
Appraiser, II. 212.
Apprenticeship, II. 212.
Appropriation, sup. 209.
Arbitrage, II. 311.
Arbitration, II. 311; sup. 215
Arraignment, II. 628.
Arrest, II. 629; sup. 247.
Arrest of judgment, sup. 248.
Arson, II. 635.
Assault, II. 724.
Assets, II. 729; sup. 268.
Assignment, II. 729.
Assize, II. 729.
Association, II. 730.
Attachment, III. 50; sup. 283.
Attainder, III. 52.
Attorney, III. 62; sup. 284.
Barristers, III. 344.
Bench warrant, sup. 415.
Blasphemy, III. 805.
Bigamy, III. 668.
Bill of exceptions, sup. 470.
Bona fide, sup. 514.
Bounty, sup. 533.
Breach of promise, sup. 534.

Bribery, IV. 278 ; sup. 563.
Burden of proof, sup. 624.
Burgage, IV. 532.
Capias, sup. 689.
Casuistry, V. 203.
Certiorari, sup. 737.
Contract, VI. 322.
Costs, VI. 451.
Conveyancing, VI. 324.
Codicil, sup. 853.
Conspiracy, VI. 292.
Company, VI. 221, 434.
Contraband, VI. 320.
Conveyancing, sup. 905
Crime, VI. 582.
Damages, VI. 787 ; sup. 1228.
Deodand, VII. 100.
Deposition, sup. 1030.
Descent, sup. 1033.
Desertion, sup. 1034.
Domicile, VII. 351.
Divorce, VII. 300–305.
Duel, VII. 511 ; XVII. 820.
Duress, sup. 1096.
Embezzlement, VIII. 159.
Employer and employee, sup. 1198.
Equity, VIII. 510.
Entail, VIII. 450.
Estoppel, VIII. 563.
Eviction, sup. 1224.
Evidence, VIII. 738.
Emigration, VIII. 173.
Exchange, VIII. 783.
Execution, sup. 1228.

Executors and administrators, VIII. 800.
Ex post facto, sup. 1231.
Extradition, VIII. 813; sup. 1231.
Factors, VIII. 843.
Felony, IX. 68.
Flotsam and Jetsam, IX. 342.
Forgery, IX. 413.
Franchise, sup. 1325.
Fraud, IX. 726; sup. 1332.
Games and gaming, X. 66.
Gavelkind, X. 119.
Garnishment, sup. 1375,
Genealogy, X. 142.
Gift, X. 590.
Guilds, XI. 359.
Habeas corpus, sup. 1503.
Hiring, XII. 1.
Holidays in the United States, sup. 1595.
Homestead, XII. 122.
Homicide, XII. 124.
Hotch-potch, XII. 308.
Impeachment, XII. 717.
Indictment, XII. 842.
Infamy and infamous crime, sup. 1679.
Information, sup. 1679.
Insurance, XIII. 161.
Infant, XIII. 1.
Infringement, sup. 1680.
Inheritance, XIII. 77.
Injunction, sup. 1682.
Insanity, XIII. 111.
Intestacy, XIII. 197.
Kidnapping, XIV. 69.
Legacy, sup. 1856.

Libel and slander, XIV. 505; sup. 1872.
Lien, XIV. 569.
License, sup. 1878.
Limitation, statutes of, XIV. 65.
Limitation of actions, sup. 1887.
Misdemeanor, XVI. 502.
Monopoly, XVI. 757.
Mortgage, XVI. 848.
Murder, XVII. 52.
Outlaw, XVIII. 75.
Oyer and terminer, XVIII. 106.
Pardon, XVIII. 271.
Partition, XVIII. 328.
Partnership, sup. 2303.
Patents, XVIII. 354.
Payment, XVIII. 440.
Penalty, sup. 2335.
Perjury, XVIII. 548.
Petition, XVIII. 703.
Pension, sup. 2344.
Pleading, XIX. 217.
Penitentiary, XIX. 748.
Poor, XIX. 462.
Prescription, XIX. 704.
Prisons, XIX. 747.
Primogeniture, XIX. 733.
Quarantine, XX. 153.
Quare impedit, XX. 158.
Quo warranto, XX. 189; sup. 2487.
Quorum, sup. 2486.
Receivers, sup. 2516.
Recognizance, XX. 309.
Records, XX. 310.
Registration, XX. 342.

Rent, XX. 402.
Replevin, XX. 404.
Rights, Personal, XX. 555.
Riot, XX. 564.
Sale, XXI. 205.
Sea laws, XXI. 583.
Settlement, XXI. 692.
Simony, XXII. 84.
Smuggling, XXII. 185.
Solicitor, XXII. 251.
Stamp, XXII. 448.
Subpœna, XXII. 642; XXIV. 696.
Succession, XXII. 616.
Summons, XXII. 642.
Sumptuary, XXII. 643.
Surrender, XXII. 692.
Taxation, XXIII. 85; IX. 117.
Theft, XXIII. 231.
Threats, sup. 2904.
Treason, XXIII. 525.
Tort, XXIII. 454; VI. 587.
Trespass, XXIII. 552.
Trial, XXIII. 555.
Trust, XXIII. 595.
Usury, XXIV. 17.
Venue, XXIV. 162.
Wills, XXIV. 570.
Witness, XXIV. 623; VIII. 743.
Wreck, XXIV. 687.
Writ, XXIV. 692.

VIII. TEN BOOKS FOR LAWYERS.

Justinian's Institutes, XIII. 794.
Hunter's Exposition of Roman Law, XIV. 362.

Blackstone's Commentaries on the Laws of England, III. 801.

Littleton on Tenures, XIV. 704.

Coke's Institutes ("Coke upon Littleton"), VI. 120.

Austin's Province of Jurisprudence Determined, XIV. 354.

Sir Henry Maine's Early History of Institutions, XIV. 364.

Hobbes's Leviathan, VIII. 422.

Jeremy Bentham's Rationale of Judicial Evidence, III. 576.

Hallam's Constitutional History of England, XI. 393.

See, also, the chapter entitled *The American Citizen*, in this GUIDE.

CHAPTER XLIX.

THE MAGISTRATE AND POLICEMAN.

"Your scope is as mine own, so to enforce or qualify the laws."
—*Measure for Measure.*

Criminal Justice.

THAT branch of criminal justice which comprises a methodical system for the prevention and detection of crime is very appropriately called *The Police*. The object of the police system, however, extends beyond the mere suppression of crime, and includes the regulation of whatever is injurious to the peace, morality, and welfare of the community. It is very evident that the person who is invested with authority to enforce the observance of law and order should have at least some general knowledge of the objects, aims, and methods of police justice. The history of crime and of the public efforts constantly necessary for its suppression presents many problems for the consideration of lawmakers, while at the same time it affords much food for thought to those who are entrusted with the duty of enforcing the laws. The following references will direct readers of the *Britannica* to a vast amount of interesting information relative to crime and its punishment and the various duties of the policeman. The policeman himself will find these readings not only entertaining, but in the highest degree profitable.

Ædile, Roman public officer, I. 180.
Quæstor, Roman magistrate, XX. 145.
Sheriff, XXI. 800.

Constable, VI. 294.
Magistrate, XV. 216; XIII. 762, 789.

Officers.
Police Commissioners, XIX. 337.
Policemen in the United States, XIX. 341.
Police in various countries, XIX. 341–344.
Detectives, XIX. 337.

Pinkerton laws, sup. 2392.
Gaoler, XIX. 747.

Arrest, II. 629.
Warrant, XXIV. 371.

Procedure.
Subpœna, XXII. 642.
Summons, XXIV. 696; XIX. 220.
Trial, XXIII. 955.
Jury, XIII. 783.

Justice of the peace, XIII. 789.
Court of justice, XXII. 641.
Witnesses, XXIV. 623; VIII. 743; XIX. 777.
Plea, XIX. 219.
Advocate, I. 127.
Judgment, XIII. 764.
Habeas corpus, XI. 358.
Corpus delicti, sup. 922.
Pardon, XVIII. 271.

Crime, VI. 582.

Crime.
Roman laws in relation to crime, XX. 675.
Criminal law, VI. 587.
Criminal courts, VI. 516.
Criminality, sup. 942.

Criminal anthropology, sup. 196.
Identification of criminals, sup. 943.
Bartillon system of identification, sup. 436.
Vidocq, the famous French detective, sup. 3045.

Burglary, sup. 625.
Crime in the United States, sup. 2986.

Punishment of crime, XIX. 747.
Punishment under Roman law, XX. 675.
Punishment. Stocks, XXII. 560.
Branks for scolds, sup. 550.
Torture, XXIII. 460.
Drowning for punishment, sup. 1083.
The garrote, sup. 1371.
The knout, XXI. 91.
Whipping-post, sup. 2138.
Capital punishment, sup. 689.
Imprisonment, XIX. 747.
Prisons, sup. 2451.
Prison reform, IX. 307, 805; XII. 320.
Prison discipline, XIX. 747.
Reformatory schools, XX. 338.
Reformatories, sup. 2525.
Transportation of convicts, XIX. 748, 750.
Ticket of leave, convicts on, VI. 590.
Penitentiaries, XIX. 748.
Prison discipline in the United States, XIX. 763.
Work-houses, XIX. 468, 476.

For further references, see the chapter entitled, *The Lawyer*, in this GUIDE.

CHAPTER L.

THE PHYSICIAN.

"Then give place to the physician, for the Lord hath created him: let him not go from thee, for thou hast need of him."—*Ecclesiasticus.*

Medicine.

MEDICINE, the subject-matter of one of the learned professions, includes a wide range of scientific knowledge and skill. In the *Encyclopædia Britannica* it receives a large share of attention, both in its historical and scientific aspects. The special article on this subject, XV. 794–817, gives first a synoptical view of medicine, and then, in the second part, traces its history from its small beginnings in Greece down to the present time. Let us reverse this order, and present first a series of readings or references on

THE HISTORY OF MEDICINE.

Among the ancient Greeks the actual organization of the healing art was ascribed to Æsculapius (or Asclepius), of whom we have a special notice in I. 209. We are now ready to read the section on medicine as portrayed in the Homeric poems, XV. 799, after which we shall take up the following subjects in their order:

Hippocratic medicine, XV. 800.

Hippocrates, "the father of medicine," XI. 852; his surgery, XXII. 674.

Alexandrian school of medicine, XV. 800, and XXII. 674.

Roman medicine, XV. 802 ; Asclepiades of Prusa, II. 679 ; Galen, X. 23 ; Aretæus, II. 485.

Byzantine School of Medicine, XV. 804.

Arabian medicine, I. 805, XV. 805 ; Avicenna, III. 152 ; Averroes, III. 149 ; Maimonides, XV. 295.

Medicine in the Middle Ages, XV. 806.

The Period of the Renaissance, XV. 807. See, also, Linacre, XIV. 652 ; Rabelais, XX. 193 ; Paracelsus, XVIII. 234, and XXII. 676 (see, in this volume, the references to Alchemy, pages 137, 138).

Revival of ancient medicine, XV. 809.

Medical Associations in the United States, sup. 2024.

American Academy of Medicine, sup. 32.

Medical education in the United States, sup. 2025.

GREAT PHYSICIANS.

John Kaye, founder of Caius College, IV. 648.

William Harvey, and the discovery of the circulation of the blood, XI. 502.

Van Helmont, XI. 638.

Borelli, and the Iatro-Physical school, IV. 53.

Francis de le Boë, and the Iatro-Chemical school, XV. 810.

Thomas Sydenham, "the English Hippocrates," XXII. 805. He was the intimate friend of John Locke, "the great sensational philosopher," who was also a thoroughly trained physician, and practiced medicine privately, XIV. 751.

Hermann Boerhaave, the organizer of the modern method of clinical instruction, III. 854.

George Ernest Stahl, originator of the theory of "animism," XXII 444 ; II. 55.

Morgagni, who was the first to make morbid anatomy a branch of medical research, XVI. 821.

William Cullen, VI 694.

John Brown, "the last systematizer of medicine"—originator of the Brunonian system—IV. 384.

Hahnemann, founder of the Homœopathic school, XI. 373; XV. 814.

Rudolf Virchow, the German pathologist, sup. 3050.

Edward Jenner, discoverer of vaccination for smallpox, XIII. 622; XXIV. 23.

Leopold Avenbrugger, inventor of the method of recognizing diseases of the chest by percussion, III. 100, 145.

Laennec, inventor of the method of physical diagnosis by the stethoscope, XIV. 200.

Erasmus Darwin, VI. 830; XV. 816.

Richard Bright, discoverer of the disease known by his name, sup. 571.

William C. Röntgen, discoverer of the Röntgen rays, sup. 2574.

John Abercrombie, I. 36.

John Abernethy, I. 47.

Erik Acharius, I. 94.

Sir J. F. E. Acton, I. 133.

Alexander of Tralles, I. 486.

Prospero Alpini, I. 619.

Charles Alston, I. 638.

Johann Conrad Amman, I. 739.

John Arbuthnot, II. 325.

Neil Arnot, II. 627.

Aspasius, II. 714.

Andrew Combe, VI. 179.

John Elliotson, VIII. 148.

Austin Flint, sup. 1289.

Robert Koch, discoverer of the "lymph" remedy for consumption, sup. 1804.

Sir Morell Mackenzie, the great throat specialist, sup. 1958.

Louis Pasteur, discoverer of the cause and cure of hydrophobia, sup. 1642, 2308.

But it is unnecessary for the GUIDE to go farther in this direction. To give a complete list of the men who have distinguished themselves in this profession would transcend the limits assigned to this chapter.

SYNOPTICAL VIEW OF MEDICINE.

See the special article on this subject, XV. 794. The following articles, or parts of articles, may also be consulted as occasion requires:

Relation of medicine to the body politic, XV. 797.

Subdivisions of Medicine as an art and discipline, XV. 796.

Surgery, XXII. 672.

Surgical pathology, sup. 2826.

Obstetrics—Gynæcology, XV. 797.

Dermatology, XXII. 120; XVIII. 269.

Ophthalmology, XVII. 780.

Laryngology, XXIII. 319.

Otology, VII. 591.

Dentistry, VII. 95; artificial teeth, XIII. 523; teeth, XXII. 107; human teeth, VII. 232.

PATHOLOGY, the doctrine of disease, XVIII. 361–407 (very fully illustrated).

See Miscellaneous Topics, below.

THE HUMAN BODY.

ANATOMY, I. 799–908. This is a very complete treatise, describing the special anatomy of the human body in a state of health. It is amply illustrated with diagrams and full-page plates.

Skeleton, XX. 105.
Muscles, XIX. 8.
Vascular system, or organs of circulation, XXIV. 95.
Digestive organs, VII. 221.
The skin, I. 897.
Nervous system, XIX. 23.

PHYSIOLOGY, XIX. 8–43. This valuable article is in two parts (part I., general view; part II., the nervous system).

Comparative Physiology, III. 684.
Digestion, VII. 221.
Circulation, XXIV. 98; XI. 503.
Nutrition, XVII. 675.
Absorption, I. 58; XVII. 677.
Animal heat, XVIII. 393.
Vivisection, sup. 3058.

HYGIENE, XII. 566. This is a short article of a popular character, referring to (1) climatic conditions, (2) site of dwellings, (3) sanitation of dwellings, (4) ventilation, (5) cleansing, (6) water supply, (7) work and exercise, etc.

Dietetics, VII. 200.
Athletic training and exercise, III. 12; XXI. 60.
Ventilation, XXIV. 157.
Sanitation of dwellings, XXI. 714.

SURGERY.

The general article on this subject, XXII. 672–692, is a complete treatise of great interest and practical value. It embraces

History and Practice.

(1) The history of surgery, XV. 672.
(2) Practice of surgery, XV. 677.
Treatment of injuries, XV. 680.
Process of repair, XV. 682.
Treatment of diseases, XV. 683.

Operative surgery, XV. 688.

The supplementary article on American surgery, sup. 2826–2832, describes the recent wonderful advancements made in the practice of this art.

Inflammation and ulceration, sup. 2827.

Fractures, sup. 2828.

Tumors, sup. 2828.

Operative surgery, and the brain, sup. 2829.

Abdominal surgery, sup. 2830.

Surgical treatment of appendicitis, sup. 2831.

Surgical treatment for kidney diseases, sup. 2832.

Several other related topics are treated specially, each under its own title. Among them are

Blood-poisoning, XXI. 666.

Tracheotomy, sup. 2933.

Detection of blood-stains, sup. 501.

Artificial limbs, sup. 255.

SCHOOLS OF MEDICINE, ETC.

Allopathy, sup. 134.

American Eclectic School of Medicine, sup. 153.

Homœopathy, XII. 126.

Hydropathy, XII. 542; III. 438.

Isopathy, sup. 1717.

Massage, or Swedish Movement, see Ling, sup. 1889.

MISCELLANEOUS TOPICS.

Schizomycetes — the germ theory of disease, XXI. 398–407 (illustrated); Bacteriology, sup. 311. The latter is an exceedingly valuable article, presenting the results of the latest researches.

Embryology, VIII. 163.

Anæsthesia, I. 789; sup. 174.

Apoplexy, II. 193.

Antidotes, XIX. 276.
Auscultation, III. 100.
Bronchitis, IV. 362.

Miscellaneous Topics.

Catarrh, V. 218, XVIII. 377; of the stomach, XXII. 574.

Cholera, V. 682. The latest discoveries and theories relating to this disease are described in sup. 795.

Croup, VI. 616; XXIII. 320.
Dietetics, VII. 200.
Digestive organs, VII. 221.
Diphtheria, VII. 249.
Drowning, VII. 473.
Enteritis, sup. 1207.
Fever, IX. 125.
Goitre, X. 739.
Gout, XI. 5.
Heart diseases, XI. 552.
Hip-joint diseases, sup. 1585.
Hydrophobia, XII. 545.
Hysteria, XII. 600.
Insanity, XIII. 95.
Jaundice, XIII. 598.
Leprosy, XIV. 468.
Longevity, XIV. 857.
Malaria, XV. 316.
Measles, XV. 657.
Neuralgia, XVII. 363.
Nutrition, XVII. 667.
Ophthalmology, XVII. 780.
Paralysis, XVIII. 255.
Parasitism, XVIII. 258.
Pharmacopœia, XVIII. 730.
Phrenology, XVIII. 842.

Phthisis, XVIII. 855.
Plague, XIX. 159.
Pleurisy, XIX. 222.
Pneumonia, XIX. 249.
Poisons, XIX. 275; XVIII. 406.
Public health, XX. 96.
Quarantine, XX. 153.
Quinine, XX. 184.
Rabies, XX. 190.
Scarlet fever, XXI. 376.
Smallpox, XXII. 162.
Stammering, XXII. 447.
Stomach, Diseases of, XXII. 574.
Stricture, sup. 2813.
Sunstroke, XXII. 666.
Throat diseases, XXIII. 319.
Tuberculosis, see Phthisis.
Typhus, typhoid, and relapsing fevers, XXIII. 676.
Vaccination, XXIV. 23.
Vascular system, XXIV. 95.
Vesical diseases, XXIV. 188.
Veterinary science, XIV. 197.
Yellow fever, XXIV. 734.

Diseases, etc.

Of shorter and less important articles on medical subjects, the number is so great that we cannot undertake to name them here. The mention of a few, as below, will serve to indicate the vast amount of medical lore contained in the *Britannica:*

Abortion, I. 52.
Achor, sup. 38.
Ague, IX. 126.
Acupressure, I. 133.

Anchylosis, II. 9.
Aneurism, II. 26.
Angina pectoris, II. 29.
Asphyxia, II. 716.
Asthma, II. 736.
Ataxy, Locomotor, II. 826.
Auscultation, III. 100.
Bright's Disease, IV. 345.
Cancer, IV. 800.
Cautery, sup. 727.
Clubfoot, VI. 42.
Colic, VI. 140.
Corpulence, VI. 435.
Cramp, VI. 572.
Croup, VI. 616.
Diabetes, VII. 147.
Endemic diseases, sup. 1200.
Epilepsy, VIII. 479.
Erysipelas, VIII. 531.
Glanders, X. 634.
Hydrophobia, sup. 1642.
Paralysis, XVIII. 255.
Meningitis, XVI. 11.
Rheumatism, XX. 516.
Rickets, XX. 548.
Whooping-cough, XII. 154, etc.

REMEDIES.

Remedies are treated in a like comprehensive manner; only a few are named, merely as examples:

Antitoxin, sup. 201.
Arnica, II. 623.
Calomel, IV. 711.
Cod-liver oil, VI. 104.

Emetics, VIII. 171.
Epsom salts, VIII. 496.
Galbanum, X. 22.
Goa-powder, X. 707.
Mercury, XV. 34.
Quinine, XX. 184.
Tuberculin, sup. 2954.
Antagonism of drugs, sup. 193, etc.
See the references in the chapter entitled, *The Apothecary*, in this GUIDE.

INSTRUMENTS USED IN MEDICINE AND SURGERY.

Stethoscope, III. 100.
Eophone, sup. 1208.
Enucleator, sup. 1208.
Hæmocytometer, sup. 1504.
Surgeon's tools, sup. 2825.
Surgeon's illuminating apparatus, sup. 1657.
Sphygmograph, sup. 2773.
Trephine, sup. 2941.

CHAPTER LI.

THE APOTHECARY.

"By medicine life may be prolonged, yet death will seize the doctor too."—*Cymbeline.*

THE word apothecary is derived from the Greek *apothéke*, the name which Galen (X. 23; XV. 803) applied to the closet or room in which he kept his medicines. In America an apothecary is often called a druggist; but in some sections of the country the term pharmacist, or pharmaceutical chemist, is frequently applied to him. Generally speaking, an apothecary is a person who compounds and sells drugs and medicines.

Definition.

In 1868 an act was passed by the British Parliament prohibiting any person from engaging in this business without being registered. Since that time many of the States of the American Union have passed similar laws. In most parts of our country an apothecary is now obliged to pass an examination before a State Board of Pharmacy before he is permitted to compound medicines or fill physicians' prescriptions. In some of the States this examination is very rigid, and only such applicants as are thoroughly conversant with the principles of pharmacy and its related subjects can reasonably hope to pass the ordeal. To persons looking forward to an examination of this kind, the following references to the *Encyclopædia Britannica* will be of much valuable assistance:

Short history of the business of apothecary in England, II. 198.

History.
- Pharmacopœia, XVIII. 730.
- International pharmacopœia, XVIII. 731.
- Dispensary, sup. 1053.

Pharmaceutical chemists, XV. 799.

Materia Medica, XVIII. 730–731.
Forensic Medicine, XV. 778–783.
Organic Chemistry, V. 444.
Practical botany (see Index, IV. 162).
Chemical affinity, I. 153, 226.
Poisons, XIX. 275; XVII. 231.
Intoxicants, VII. 482.
Narcotics, XVII. 230.
Stimulants, VII. 205.
Tonics, sup. 2927.
Anæsthetics, XVII. 230.
Anæsthesia, I. 789.

Some Things in the Apothecary's Stock.
- Alcohol, I. 469.
- Quinine, XX. 184.
- Opium, XVII. 231, 787.
 - Morphia, XVII. 231, 792.
- Chloroform, V. 680.
- Chloral, V. 676, 677.
- Cocaine, VI. 685; sup. 851.
- Acetylene, or ethine gas, sup. 37.
- Antacids, sup. 193.
- Antipyrin, sup. 199.
- Antitoxin, sup. 201.
- Aromatic vinegar, sup. 246.
- Bromide of ethyl, sup. 582.
- Ethylamine, sup. 1218.

Fungicides, sup. 1350.

Hippuric acid, sup. 1587.

The above list might be indefinitely extended, but enough is here given to show the variety of information that the *Encyclopædia Britannica* offers to the apothecary or pharmacist.

Consult carefully the references given in this GUIDE, in the chapters entitled *The Physician* and, *The Chemist.*

CHAPTER LII.

THE CHEMIST.

"You are an alchemist. Make gold!"

—*Shakespeare.*

HISTORY OF CHEMISTRY.

THE advancement of the science of chemistry during the past quarter of a century has perhaps been greater than during any preceding period of similar length. The article in the American supplements to the *Britannica*, pages 767–775, describes in a brief but comprehensive manner all the more important discoveries made since the year 1875. The complete history of the science is told in the fifth volume of the *Britannica*, in the very scholarly article on that subject, beginning on page 459.

History. The first mention of chemistry is found in the dictionary of Suidas, who flourished in the 11th century (see XXII. 631). He defines it as "the preparation of silver and gold," and all the efforts of the early chemists (whom we now call alchemists) seem to have been directed toward the finding of some method for making gold and silver.

From the 11th to the 15th century, alchemy was diligently studied by the philosophers of Europe.

This period marks the "sickly but imaginative infancy" of modern chemistry (see Alchemy, I. 459). It was Paracelsis who declared that "the true use of chemistry is not to make gold, but to prepare medicines" (see XVIII. 234).

FAMOUS CHEMISTS.

Van Helmont (1577–1644), XI. 638.

Glauber (1604–1668), the discoverer of Glauber's salt, X. 675.

Robert Boyle (1627–1691), IV. 184.

F. Hoffman, XII. 46.

Sir Isaac Newton, who was the first to indicate the nature and modes of formation of gases, XVII. 438 (see Index).

Dr. Stephen Hales (1677–1761), who was the first to describe the air as "a fine elastic fluid," XI. 382.

Dr. J. Priestley (1733–1804), the discoverer of oxygen gas, XIX. 730.

Henry Cavendish (1731–1810), the inventor of the pneumatic trough, V. 271.

Lavoisier (1743–1794), XIV. 252.

Dr. Dalton, originator of the atomic theory, VI. 784.

Gay-Lussac, discoverer of the laws of the combinations of gases by volume, X. 121.

Alexander Von Humboldt, XII. 343.

Robert Hare, sup. 1526.

Justus Liebig, XIV. 565 (see Index).

Michael Faraday, IX. 29.

William Crookes, sup. 950.

Robert Ogden Doremus, sup. 1067.

The following supplementary articles will be found interesting to every chemist:

Animal Chemistry, sup. 188.

Azotized bodies, sup. 305.

Physiological Chemistry, sup. 2379.

Stereochemistry, sup. 2785.

CHEMICAL ELEMENTS.

All of the more important "elementary or simple bodies" met with in nature are described in special articles in the *Britannica*. Among these are:

Aluminium, I. 647.

Antimony, II. 129.

Elements.

Arsenic, II. 634.
Barium, V. 525.
Bismuth, III. 790.
Boron, V. 520.
Bromine, IV. 631.
Calcium, XIV. 647.
Carbon, V. 86.
Chlorine, V. 678.
Cobalt, VI. 81.
Copper (see Index volume, page 111).
Gold (see Index volume, page 184).
Hydrogen, XII. 433.
Iodine, XIII. 202.
Iron (see Index volume, page 226).
Lead, XIV. 374.
Magnesium, XV. 217.
Mercury, XVI. 31.
Nickel, XVII. 487.
Nitrogen, XVII. 515.
Oxygen, V. 479.
Phosphorus, XXIII. 815.
Platinum, XIX. 189.
Potassium, XIX. 588.
Silicon, V. 521.
Silver (see Index volume, page 405).
Sodium, XX. 240.
Sulphur, XXII. 634.
Tin, XXIII. 400.
Zinc, XXIV. 784.

Argon, a new gaseous constituent in the atmosphere, sup. 227.

A complete list of the elements, so far as now known, is given in sup. 768. The discovery of several new elements is described in sup. 771.

A FEW ADDITIONAL TOPICS.

Atomic theory, V. 465.
Molecular weights, V. 471.
Chemical notation, V. 472.
Organic Chemistry, V. 544; sup. 775.
Animal Chemistry, sup. 2785.
Formulæ of Organic Compounds, V. 547.
Classification of Organic Compounds, V. 551.
Hydrocarbons, V. 556.
Haloid ethers, V. 565.
Ethers, V. 566.
Aldehydes, V. 567.
Ketones, V. 568.
Organic acids, V. 569.
Ethereal salts, V. 572.
Organo-metallic bodies, V. 573.
Amides, V. 577.
Unclassified organic compounds, V. 578.

CHAPTER LIII.

THE MINERALOGIST.

"Stones whose rates are either rich or poor,
As fancy values them." —*Measure for Measure.*

A COMPLETE description of mineral species, illustrated with numerous diagrams and cuts, is given, XVI. 380–429.

Mineral Species.

Very many of the minerals so described are noticed at still greater length in special articles. The following are a few of the most important:

Alabaster, I. 439.
Alum, I. 643; XVI. 402.
Aluminum, I. 647.
Amber, I. 659.
Amethyst, I. 736.
Anthracite, II. 106.
Antimony, II. 129.
Arsenic, II. 634.
Asbestos, II. 675.
Asphaltum, II. 715.
Barytes, III. 406.
Beryl, III. 613.
Bismuth, III. 790.
Bitumen, XVI. 428.
Borax, IV. 50.
Calcite, X. 228.
Calc-spar, IV. 653.
Calomel, IV. 711.
Carbuncle, V. 89.
Carnelian, I. 277.
Chalcedony, I. 277.



Chalk, V. 372.
Cinnabar, V. 785.
Clays, X. 237.
Coals (see reference given in *The Miner*.)
Cobalt, VI. 81; XX. 23.
Copper (see references given in *The Miner*.)
Copperas, VI. 352.
Diamond, VII. 162; diamond mining, XVI. 455; in South Africa, V. 42; in Brazil, IV. 224; in India, XII. 766; cutting diamonds, XIV. 298.
Emerald, VIII. 170.
Emery, VIII. 171.
Feldspar, X. 227.
Flint, IX. 325.
Fuller's earth, IX. 816.
Galena, XIV. 375.
Garnet, VIII. 640.
Gold (see references in *The Miner*.)
Graphite, XVI. 381.
Gypsum, XI. 351.
Hornblende, X. 228.
Hornstone, XVI. 389.
Ice, XII. 611.
Iceland-spar, IV. 653.
Iron (see references in *The Miner*.)
Jasper, XIII. 596.
Jet, XIII. 672.
Kaolin, XIV. 1, 90.
Lead (see references in *The Miner*.)
Lignite, VI. 46.
Limestone, X. 232.
Loam, XVI. 424.
Magnesia, XV. 218.
Manganese (red), XVI. 398.

Marble, XV. 528.
Marl, IV. 281.
Meerschaum, XV. 825.
Mercury, XVI. 31 (see Index volume, page 288).
Meteoric iron, XIII. 285.
Mica, X. 228.
Naphtha, XVII. 174.
Nickel, XVII. 487.
Opal, XVII. 777.
Petroleum, XVIII. 712; as fuel, IX. 809.
Platinum, XIX. 189.
Pyrites, XX. 128.
Quartz, XX. 160.
Rock-salt, X. 228; XXI. 230.
Ruby, XXI. 47.
Salt, XXI. 228; mines in Austria, III. 120; on Caspian Sea, V. 178; production in the United States, XXIII. 817.
Saltpetre, XXI. 235.
Sapphire, XXI. 302.
Sappirite, XVI. 409.
Shale, XVI. 424; bituminous, XVIII. 240.
Silver (see references in *The Miner*.)
Slate, XXII. 127; quarries of, XVI. 454.
Sulphur, XXII. 634; mines in Sicily, XXII. 30; in Formosa, V. 636.
Talc, X. 228.
Tin (see references in *The Miner*.)
Topaz, XXVIII. 446.
Tourmaline, X. 228.
Umber, XVI. 425.
Zinc (see references in *The Miner*.)

CHAPTER LIV.

THE PREACHER AND THEOLOGIAN.

"I preached as never sure to preach again,
And as a dying man to dying men."
—*Richard Baxter*, 1650.

"The altitude of literature and poetry has always been religion—and always will be."—*Walt Whitman.*

Religious Knowledge.

THE *Encyclopædia Britannica*, embracing as it does the whole range of human knowledge, must necessarily devote a large amount of attention to subjects connected with the religious history and religious thought of the world. The number of articles which it contains of this kind, their comprehensiveness, and the breadth of scholarship which they display, are alike amazing. Few private theological libraries contain so much matter of a quality that is so uniformly excellent. To the minister, the pastor, the church official, and the theological student, the *Britannica* offers a fund of information and a wealth of knowledge which can be derived from no other single publication in the English language. It is not the intention in this chapter to locate or point out all the articles that relate to theological or religious subjects. To do so would oblige us to go beyond all the limitations assigned to this volume. It will be sufficient to name a few of the most important subjects, as the reader, when once fairly introduced into this department of knowledge, will be able readily to refer to others of a similar character.

I. RELIGIONS.

Five Great Religions.

The special article on the religious beliefs and modes of divine worship peculiar to different tribes, nations, and communities, written by Professor C. P. Tiele, of the University of Leyden, XX. 358–370, will be an excellent introduction to this course of study. It may be followed by the reading of such additional articles as these:

1. CHRISTIANITY, V. 688–702. A comprehensive survey of the history and influence of Christianity. By Professor T. M. Lindsay, of Free Church College, Glasgow.

2. JUDAISM. See the two articles, Israel, XIII. 369–431, and JEWS, XIII. 679–687. These articles are chiefly historical, the first by Dr. Julius Wellhausen, of the University of Halle; the second by Israel Davis, of London.

Jews in the United States, sup. 1757–1760.

3. BRAHMANISM, IV. 201–211. By Dr. Julius Eggeling, of the University of Edinburgh.

4. BUDDHISM, IV. 424–438. By Dr. T. W. Rhys Davids, of London.

5. MOHAMMEDANISM, XVI. 545–606. A very comprehensive article in three parts:

Part I. Mohammed, by Professor Wellhausen.

Part II. The Eastern Caliphate, by Professor Stanislas Guyard.

Part III. The Koran, by Professor Nöldeke.

Other Beliefs.

Besides the above, there are special articles on all other religious beliefs and systems that have ever exerted any considerable influence upon the thought of mankind. The following articles will be of interest to many readers:

Druidism, VII. 477.

Zoroastrianism, XXIV. 822.

For an account of the religion peculiar to any given country, see the article devoted to that country; for example:

Religion in Mexico, XVI. 211 a.
Religion of Hottentots, XII. 311 b.
Religion in India, XII. 782 a.
Religion in Abyssinia, I. 63.
Religion in Africa, I. 65.
Religion of gypsies, X. 616, etc.

II. BELIEF IN GOD.

Closely allied in thought to the articles mentioned above are such as the following:

THEISM, XXIII. 234–249. This embraces a survey of primeval religious ideas, with notices of polytheism, monotheism, trinitarianism, unitarianism, deism, mysticism, agnosticism, etc.

Deism, VII. 33.

Theosophy, XXIII. 278; sup. 2893; Madame Blavatsky, sup. 495; William Q. Judge, sup. 1761.

Kabbalah, XIII. 810.

Rationalism, XX. 289.

Agnosticism, sup. 85.

Idolatry, XII. 698.

Fetichism, IX. 118.

See also God, in Index volume, page 184.

III. DOCTRINE, ETC.

Read the special article on THEOLOGY, XXIII. 260–276; also the following:

APOLOGETICS, II. 189; sup. 1224.

Christian Doctrine. Evidences of Christianity, sup. 1224.

DOGMATICS, VII. 332–342, "a branch of theological study which treats of the doctrine of Christianity."

HERMENEUTICS, XI. 741–749, "which treats of Scripture interpretation."

Harmony of the Gospels, sup. 1528.

ESCHATOLOGY, VIII. 534–538, "the doctrine of the last things."

Immortality. See Butler, IV. 584; Plato, XIX. 199, 209; Vedanta, XXIV. 118.

CREEDS, VI. 558–565, "authorized formularies of Christian doctrine."

To these longer articles many others might be added, such as:

The Holy Ghost, sup. 1600.
Predestination, XIX. 668.
Atonement, sup. 282.
Imputation, sup. 1661.
Justification, sup. 1763.
Inspiration, XIII. 154.
Sanctification, XVIII. 425.
Prophecy, XIX. 814.
Anthropomorphism, II. 123.
Transubstantiation, VIII. 653; sup. 2567.
Perfectionism, sup. 2348.
Antichrist, II. 124.
Christian Apocalyptic, II. 179.
Apostasy, II. 189.
Heresy, XI. 732.
Arminianism, sup. 236.
Apostolic Succession, sup. 205.
Indulgence, XII. 846.
Immaculate Conception, XII. 715.
Consecration, VI. 291.
Beatification, sup. 391.

See, also, the references to Christianity and Church history below.

IV. CHRISTIANITY.

Christianity, V. 688; creeds of, VI. 558; doctrines of VII. 332; ethics of, VIII. 588; theology of, XXIII. 239.

Christ, V. 687.

The testimony of the Gospels to Jesus Christ, XIII. 659.

Christology, sup. 799.

The CHURCH, V. 758.

Views of Christianity by famous writers and philosophers:

Origen's, XVII. 841.

Irenæus's, XIII. 274.

Clement's, V. 820.

Lessing's, XIV. 482.

Locke's, XIV. 756.

Rousseau's, XIII. 670.

Voltaire's, IX. 669.

1. ROMAN CATHOLIC CHURCH, sup. 2566–2573, an important and very comprehensive article by Cardinal Gibbons, should be read in connection with the general article on the same subject, XX. 628–631, by P. L. Connellan, of Rome. See also POPEDOM, XIX. 487–510.

Christian Societies and Churches.

This latter article is designed to give the main outlines of the history of the Papacy as an institution. A list of the popes is given at the end; and readers wishing to extend their knowledge of this subject by becoming acquainted with the personal history of the pontiffs may do so by referring to the special articles in the *Britannica* relating respectively to the different popes. The method of electing a pope is described in sup. 2568. The following articles may also be read:

Catholic, V. 227. (For the first use of this name, see V. 9.)

Catholics in America, sup. 2569.

Titles in the Catholic Church, sup. 2919.
Archbishops, II. 369.
Bishops, III. 788.
Abbot, I. 22.
Acolyte, I. 98.
Celibacy, V. 293.
Propaganda, XIX. 809.
Ultramontism, sup. 2977.
History of Monasticism, I. 14–21, to be read in connection with
Monachism, XVI. 698.
Asceticism, II. 676.
Religious Brotherhoods, sup. 586.
Franciscans, IX. 698.
Dominicans, VII. 354; XIII. 93.
Benedictines, III. 558; VIII. 372; sup. 417.
Carthusians, V. 163; I. 20.
Jesuits, XIII. 645; XVIII. 430; sup. 1742.
Passionists, sup. 2307.
Paulist Fathers, sup. 2326.
Trappists, XXIII. 522.
Acœmetæ (sleepless monks), I. 98.
Sisters of Charity, sup. 754.
Old Catholics, XVII. 754.

2. GREEK CHURCH, XI. 154.
Stundists of Russia, sup. 2814; XXI. 82.

3. ARMENIAN CHURCH, II. 548.

4. PROTESTANTISM, XX. 319. Of the sects of Protestantism a very large number are noticed in separate articles in the *Britannica*. The following will indicate the scope and character of these articles:

Adventists, XVI. 320; sup. 52.

Baptists, III. 353; Freewill Baptists, IX. 762; Baptists in the United States, sup. 346. This article includes brief accounts of all the different bodies of Baptists now in this country.

Catholic Apostolic, V. 237.

Christian Brethren, XIX. 238.

Dissenters, sup. 1053.

Christian Alliance, sup. 797.

Congregationalists, VI. 268; in the United States, sup. 887.

Episcopal: Church of England, VIII. 370; Protestant Episcopal Church of the United States, VIII. 493.

Disciples of Christ, sup. 1052.

Evangelical Association, VIII. 725; sup. 1221.

Free Church of England, sup. 1335.

Friends, sup. 1344 (see Quakers), XX. 147.

Independents, XII. 722.

Lutherans, XV. 84; in the United States, sup. 1931.

Mennonites, XVI. 11; sup. 2036.

Methodists, XVI. 185; in the United States, sup. 2045.

African Methodist Episcopal Church, sup. 83.

Moravian Brethren, XVI. 811; sup. 2101.

Mormons, XVI. 825.

Latter-day Saints, or Mormons, sup. 1837.

New Jerusalem Church, sup. 2177; XXII. 759.

Presbyterians, XIX. 676; sup. 2437; Cumberland Presbyterians, sup. 963.

Protestant Episcopal Church, sup. 2464.

Reformed Church, XX. 339; Alliance of Reformed Churches, sup. 132; Reformed Church in America, sup. 2526.

Salvation Army, sup. 2616.

Spiritualists, XXII. 404; II. 207.

United Brethren, XXIII. 726; sup. 2982.
Unitarians, XXIII. 725; sup. 2980.
Universalists, XXIII. 831; sup. 3001.

To these might be added an extensive list, embracing such names as the following:

Abecedarians, sup. 24.
Antinomians, II. 129.
Aquarians, II. 217.
Annihilationists, VIII. 538.
Annunciada, sup. 191.
Hussites, XII. 407.
Illuminati, XII. 706.
Latitudinarians, sup. 1837.
Christadelphians, sup. 796.
The Arminian Nunnery, sup. 1259.
Winebrennarians, sup. 804.

But it is unnecessary to attempt a complete list. The reader who so desires will now be able to continue the investigation of this subject without further assistance from the GUIDE.

V. CHURCH HISTORY.

As an introduction to another valuable course of reading, take the article entitled CHURCH AND CHURCH HISTORY, V. 758.

The number of special articles, biographical and historical, relating to the history of the Christian church may be estimated from the following incomplete list of subjects which receive treatment in the first volume alone:

Volume I:—Saint Adalbert, p. 134; Adam of Bremen, p. 138; Adiaphorists, p. 153; Adoption Controversy, p. 163; Popes Adrian, p. 165; Ætius, p. 356; Archbishop Agelnoth, p. 279; Johannes Agricola, p. 290; Bishop Aidan, p. 424; Alred, p. 475; St. Alban, p. 446; Cardinal

Albert, p. 451; Albigenses, p. 454; Bishop Alcock, p. 469; Alcuin, p. 471; Bishop Aldred, p. 475; Cardinal Aleandro, p. 476; Alesius, p. 478; Popes Alexander, p. 486; Joseph Alleine, p. 581; Felix Amat, p. 653; Amalric of Bena, p. 652; Saint Ambrose, p. 662; Nicolaus Arnsdorf, p. 778; Moses Amyrant, p. 782.

Instead of continuing this list so as to cover in the same way the remaining twenty-three volumes of the *Britannica*, the GUIDE deems it sufficient to name merely a few of the most important subjects.

Select List of Topics.

The history of the Christian church may be said to begin with the preaching of St. Peter on the day of Pentecost. See, therefore, St. Peter, XVIII. 693; Pentecost, XVIII. 514; Acts of the Apostles, I. 123.

After these, read:

Saint Paul, XVIII. 415.
Saint John, XIII. 706.
Saint Andrew, II. 20.
Revelation, XX. 506.
Apollos, II. 189.
Apostolic Fathers, II. 195.
Saint Anthony, II. 107.
Saint Augustine, III. 75.
Justin Martyr, XIII. 790.
The four Saint Gregories, XI. 775–781.
Arius, II. 537.
Saint Fulgentices, sup. 1349.
Saint Athanasius, I. 828.
Basil the Great, III. 412.
Chrysostom, V. 755.
Eusebius, VIII. 721.
Irenæus, XIII. 273.
Cyril of Alexandria, VI. 751.
Nestorius, XVII. 355.

Polycarp, XIX. 414.
Saint Barbara, sup. 350.
Saint Agnes, sup. 86.
Saint Epiphanius, XVIII. 482.
Saint Alban, I. 446.
Sylvester, XXII. 74.
Bede, III. 480.
Saint Bridget, IV. 342.
Saint Bernard, III. 601.
Crispin and Crispinian, VI. 590.
Saint Boniface, IV. 33.
Lanfranc, XIV. 282.
Anselm, II. 91.
Arnold of Brescia, II. 625.
Thomas à Kempis, XIV. 316.
Saint Benedict, III. 557.
Saint Dominic, VII. 353.
Saint Francis, IX. 692 ; Franciscans, IX. 698.
The Jesuits, XIII. 645.
History of Monasticism, I. 14.
Capuchins, V. 79.
Carthusians, V. 163.
Carmelites, V. 116.
Celestines, V. 291.
Flagellants, IX. 280.
Cloister, VI. 35.
Asceticism, III. 676.
Saint Dunstan, VII. 359.
Manichæism, XVII. 124.
The Albigenses, I. 454.
The Lollards, XIV. 810.
The Waldenses, XXIV. 322.
The Council of Basil, III. 409.
The Inquisition, XIII. 91.

Francis Xavier, XXIV. 716.
John Wycliffe, XXIV. 708.
Zwingli, XXIV. 832.
Erasmus, VIII. 512.
Martin Luther, XV. 71.
John Huss, XII. 404.
John Calvin, IV. 714.
The Huguenots, XII. 337.
The Reformation, XX. 319.
Council of Trent, XXIII. 543.
Thomas Cranmer, VI. 548.
John Knox, XIV. 130.
William Laud, XIV. 346.
Puritanism in England, VIII. 340.
George Fox, IX. 500.
John Bunyan, IV. 526.
John Wesley, XXIV. 504; VIII. 355.
Emanuel Swedenborg, XXII. 758.
Leo XIII., sup. 1864.
James Freeman Clark, sup. 819.
Alexander Campbell, sup. 667.
Phillips Brooks, sup. 584.
Henry Ward Beecher, sup. 400.
Lyman Abbott, sup. 15.
F. W. Farrar, sup. 1249.
Charles H. Parkhurst, sup. 2296.
William Booth, sup. 522.

Christian Missions, XVI. 511.
Sunday-schools, sup. 2823.
Epworth League, sup. 1210.
Christian Endeavor, Society of, sup. 797.
Young Men's Christian Association, sup. 3223.
Young Women's Christian Association, sup. 3224.

Woman's Christian Temperance Union, sup. 3182.
Society for the Promotion of Christian Knowledge, sup. 798.

VI. FORMS, CEREMONIES, AND RELIGIOUS PRACTICES.

The Seven Sacraments:
Baptism, III. 348.
Confirmation, V. 258.
Eucharist, VIII. 650; sup. 1619.
Penance, XVIII. 484.
Extreme Unction, VIII. 813.
Holy Orders, sup. 2567; II. 90.
Matrimony, sup. 2567.

Ecclesiastical costume, VI. 461.
Ablution, I. 50.
Rituals, sup. 2554.
Mass, sup. 2572.
Apostles' Creed, II. 194.
Apostles' Canons, II. 194.
The Litany, XIV. 695.
The Catechism, V. 219.
Confession, VI. 257.
Anointing, II. 90.
Holy water, XII. 105.
Adoration, I. 164.
Incense, XII. 718.
Rosary, XX. 848.
Breviary, IV. 263.
Missal, XVI. 508.
Absolution, I. 58.
Excommunication, VIII. 798; Bell, Book, and Candle, sup. 410.
Stigmatization, XXII. 548.

Fasting, IX. 44.
Sacrifice, XXI. 132.
Pilgrimage, XIX. 90.
Love Feasts, XVI. 188; V. 274.
Vows, XXIV. 300.
Hymns, XII. 577.
Dies Iræ, sup. 1046.
Kyrie Eleison! sup. 1812.
Peter's Pence, sup. 2357.

VII. HOLY DAYS, FEASTS, ETC.

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All Souls' Day, sup. 135.
Atonement Day, VIII. 806.
Candlemas, IV. 804.
Corpus Christi, VI. 436.
Feast of the Annunciation, II. 90.
Feast of the Assumption, II. 734.
Epiphany, VIII. 483.

VIII. CHURCH GOVERNMENT, ETC.

Pope (see Index volume, page 353).
Cardinal, V. 96; sup. 696.
Conclave of Cardinals, sup. 881.
Roman Congregations, sup. 888.
Patriarch, III. 788.

Bishop, III. 787.
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Abbe, I. 9.
Abbess, I. 9; abbot, I. 22.
Abbreviators, I. 29.
Advocatus diaboli (devil's advocate), sup. 54.
Catechumen, V. 220.
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Defender of the marriage tie, sup. 1013.
Parson, XVIII. 327.
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Almoner, I. 595.
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Neophyte, XVII. 332.
Canon law, V. 1–23.
Apostolic canons, II. 194.
The Thirty-nine Articles, II. 653.

IX. THE BIBLE.

For a general discussion of questions relating to the Bible and its circulation to the year 1875, see BIBLE, III. 634–650. For a comprehensive account of its circulation since 1875, see sup. 442–456. This latter article contains specimen extracts from Bibles printed in 242 languages and dialects. It is followed by a list of the Bible Societies

of the world, sup. 456, giving the number of Bibles issued by each society since its organization.

Inspiration of the Bible, XIII. 154.

Wycliffe's Bible, XXIV. 710.

The Douay Bible, sup. 1069.

Tyndale's Bible, XXIII. 76.

The Geneva Bible, VIII. 387.

The Breeches Bible, VIII. 387.

The Septuagint, XXI. 667.

King James's Version, VIII. 381.

Bible Societies, III. 649.

Bible glosses, X. 687.

Spinoza on Biblical Criticism, XXII. 402.

Higher Criticism, sup. 944.

Origen on Biblical Criticism, XVII. 840; Baur, III. 448; De Wette, VII. 144; Morinus, XVI. 824.

Revision of the Bible, sup. 2539.

See the chapter in this GUIDE entitled, *Readings for Bible Students.*

See Theological Education, sup. 2889–2892.

CHAPTER LV.

THE PHILANTHROPIST AND REFORMER.

"Love all, trust a few; do wrong to none."
—*All's Well That Ends Well.*

PHILANTHROPY, in its broadest sense, is love of mankind manifested in deeds of kindness to one's fellows. While the ultimate object of all philanthropists is the same—the mitigation of misfortune and the consequent betterment of all conditions of life—the methods which they pursue are widely different, and the immediate ends toward which they aim, are many and various. Some labor in missions, believing that in the spread of the Gospel of Christ there is the surest means of promoting human happiness. Some devote their energies to measures of reform, hoping that by effecting certain changes, whether in the political or the social world, mankind may be elevated to a higher plain of existence. Some have been fearless antagonists of slavery and other forms of oppression, and their voices have always championed the cause of the weak, the downtrodden, and the poor. Some labor in behalf of prison reform, and strive to bring about better and more humane methods of dealing with criminals. Some are active in deeds of charity and in the promotion of means to improve the condition of the poor. And so each philanthropist works in his own field, but all are actuated by the same impulse—the impulse of sympathy and love, the impulse to do good to suffering humanity. To all who are interested either directly or

Philanthropy.

indirectly in any form of philanthropical effort, the *Encyclopædia Britannica* offers a mine of valuable information. The following lists of references, although by no means exhaustive, will be of assistance to every one who seeks to know more about the active benevolences of the world.

For a comparison between Pagan and Christian philanthropy, see VIII. 590.

I. MISSIONS AND MISSIONARIES.

List of missionary societies, XVI. 515.
Christian missions, XVI. 511.
Missions in China, XIX. 810; XVI. 517.
Missions in India, XIX. 811; XXIV. 716.
Missions in Japan, XVI. 517; XIII. 652.

Missionaries.

Roman Catholic propaganda, XIX. 809.
The Jesuit system of missions, XIII. 651, 654; XX. 536; in North America, sup. 1742.
Baptist missions, III. 356.

Methodist missions, XVI. 517.
Moravian missions, XVI. 811; XVI. 516.
The McAll mission in France, sup. 1940.
Francis Xavier, the Apostle of the Indies, XXIV. 716.
John Eliot, the Apostle of the Indians, VIII. 136; XVI. 514; XVII. 243.
Robert Morrison, missionary to China, XVI. 846.
William Carey, the father of Protestant missions, V. 101.
Adoniram Judson, missionary to India, XIII. 766.
Father Jogues, Jesuit missionary among the Mohawks, sup. 1745.
John Williams, missionary, XXIV. 586.
Henry Martyn, missionary to Persia, XV. 586; XVIII. 649.
Thomas Gage, first missionary to Mexico, sup. 1356.
Robert Moffat, African missionary, XVI. 543.

David Livingstone, XIV. 720; I. 247.

William Goodell, missionary in Turkey, sup. 1423.

Stephen Grellet, French Quaker missionary, sup. 1467.

Robert W. McAll, founder of the McAll missions, sup. 1940.

Samuel Marsden, the Apostle of New Zealand, XVII. 471.

William A. P. Martin, president of Tungwên College, Peking, sup. 2004.

II. FRIENDS OF HUMANITY.

Thomas Joseph Barnardo, "father of the don't live anywheres," sup. 357.

Clara Barton, founder of the Red Cross Society, sup. 367.

Philanthropists.

Charles Loring Brace, sup. 541.

Baroness Burdett-Coutts, sup. 624.

Mary Carpenter, sup. 706.

George W. Childs, sup. 789.

Peter Cooper, sup. 910.

Elizabeth Fry, English Quakeress, IX. 804.

Edward Denison, originator of "university settlements," sup. 1026.

Sarah Platt Doremus, sup. 1068.

Henry Towle Durant, founder of Wellesley College, sup. 1096.

Abigail Hopper Gibbons, sup. 1393.

Stephen Girard, founder of Girard College, X. 621; sup. 1401.

Baron Hirsch, the Jewish philanthropist, sup. 1588; Philanthropies of American Jews, sup. 1760.

Johns Hopkins, sup. 1612.

Dr. Samuel G. Howe, sup. 1624.

James Lenox, founder of Lenox Library, sup. 1864.

James Lick, founder of Lick Observatory, sup. 1878.

Sir Josiah Mason, founder of almshouses and orphanages, sup. 2009.

Sir Moses Montefiore, sup. 2096.

Geo. Müller, founder of orphans' homes, England, sup. 2124.

Florence Nightingale, sup. 2211.

George Peabody XVII. 442; sup. 2329.

Samuel Plimsoll, "the sailor's friend," sup. 2401.

Enoch Pratt, founder of Pratt Library, sup. 2436.

Charles Pratt, founder of Pratt Institute, sup. 2435.

Matthew Vassar, philanthropist and founder of the Society for the Prevention of Cruelty to Animals, sup. 3025.

George Williams, founder of the Young Men's Christian Association, sup. 3157.

Sisters of Mercy, sup. 2039.

Sisters of Charity, XVI. 713.

Prisoners' Friends.

John Howard, the father of prison reform, XII. 309.

Elizabeth Fry, IX. 804.

Theodore Fliedner, German philanthropist, IX. 307.

Enoch Cobb Wines, founder of the National Prison Association, sup. 3168.

The Prison Discipline Society, XIX. 749.

The Howard Association, sup. 1623.

The following references may be found interesting and valuable in connection with any study of human benevolence:

The Sanitary Commission, sup. 2624.

Woman's Relief Corps, sup. 3183.

Red Cross Society, sup. 2521.

The education of defective, dependent, and criminal classes, sup. 2658.

Reformatories, sup. 2525.

University settlements, sup. 3005.
Charity organizations, sup. 751.
Law and Order societies, sup. 1844.
Societies for the Prevention of Cruelty to Children, sup. 788.
Almshouses, sup. 138 ; XIX. 465.
Almsgiving in relation to Poor-laws, XIX. 463.
The Montyon Prizes (rewards for signal instances of philanthropy), sup. 2099.
Poor-laws, XIX. 462 ; sup. 2417.
English Poor-houses, XIX. 468.
Nursing, sup. 2231.
Hospitals, XII. 301.
Bellevue Hospital, sup. 411.
Guy's Hospital, sup. 1499.
Foundling hospitals, IX. 481.
Ambulance associations, sup. 151.
Hospital ambulances, I. 665.
Tenement life, sup. 2873.

III. ANTI-SLAVERY LEADERS.

Abolitionists, XXII. 141 ; sup. 28.
Abolition of slavery in the United States, XXIII. 752, 763, 767, 781.
Abolition of slavery in England, VIII. 365.
Clarkson on slavery, V. 813.
The Quakers' opposition to slavery, XVIII. 492.
John Woolman, sup. 3191.
President Jefferson's opposition to slavery, XIII. 615.
Emancipation in the United States, XXIII. 777.
William Wilberforce, XXIV. 565.
William Forster, sup. 1313.
William Lloyd Garrison, X. 85 ; XVII. 432 ; XXII. 145.
Joshua R. Giddings, sup. 1395.

Wendell Phillips, I. 723; sup. 2366.
Samuel May, sup. 2020.
Elijah P. Lovejoy, XXII. 142; sup. 1922.
Owen Lovejoy, sup. 1922.
Benjamin Lundy, sup. 1930.
James G. Birney, sup. 476.
Elizur Wright, sup. 3206.
Anna Dickinson, sup. 1043.
Harriet Beecher Stowe, sup. 2797.
John Brown, IV. 365; XI. 490.
Henry B. Stanton, sup. 2779.
John Greenleaf Whittier, I. 734.
John C. Frémont, sup. 1339.
Abraham Lincoln, XIV. 658.
Frederick Douglass, sup. 1071.

See, also, the following articles: History of Slavery, XXII. 129; Ancient Slavery, XIX. 348; the Slave-trade, XXII. 137; British and Foreign Anti-Slavery Society, sup. 576; Freedmen's Bureau, sup. 1336.

IV. REFORMS AND REFORMERS.

1. The Woman Suffrage Movement.

The first convention in the United States to advocate Woman's suffrage was held at Seneca Falls, N. Y., in 1848. Four women were present.

Elizabeth Cady Stanton, sup. 2778.
Lucretia Mott, sup. 2118.
Lucy Stone, sup. 2793.
Susan B. Anthony, sup. 195.
Mary A. Livermore, sup. 1898.
Antoinette Brown Blackwell, sup. 488.
Amelia Bloomer, inventor of the "Bloomer costume," sup. 502.
Emily Faithfull, sup. 1240.

Millicent Garrett Fawcett, sup. 1251.
Ellen H. Foster, sup. 1318.
May Wright Sewall, sup. 2694.
Women's clubs, sup. 838.
Education and enfranchisement of women, sup. 3180.

2. THE TEMPERANCE MOVEMENT.
Liquor laws, XIV. 688; sup. 1892.
Temperance legislation, XIV. 688.
Prohibition laws, sup. 1892.
Option laws, sup. 1893.
South Carolina dispensary system, sup. 1894.
The Gothenburg system, sup. 1895.
Raines liquor law, sup. 1893.
The Prohibition Party, sup. 2453.
Temperance societies, XXIII. 158.
Woman's Christian Temperance Union, sup. 3182.
Temperance societies in the United States, sup. 1892.
Father Mathew societies, XV. 631.
Good Templars, XXIII. 159; sup. 1892.
John B. Gough, sup. 1431.
Frances E. Willard, sup. 3155.

3. SOCIAL REFORMERS.
Felix Adler, founder of the Society for Ethical Culture, sup. 49; sup. 1218.
Charles Bradlaugh, English agitator and social reformer, sup. 544.
Anthony Comstock, champion of social purity, sup. 879.
Elbridge T. Gerry, president of the Society for the Prevention of Cruelty to Children, sup. 1389.
Society for Ethical Culture, sup. 1218.

CHAPTER LVI.

THE PUBLIC SPEAKER.

"Mend your speech a little,
Lest it may mar your fortunes."—*King Lear.*

HE who would excel as a public speaker must in the first place possess a thorough mastery of words. He must be able to express his thoughts in a manner which is, at the same time, pleasing, forcible, and convincing. He must have a minute and comprehensive knowledge of everything pertaining to the subject which he undertakes to discuss; and he must understand the secret influences and methods by which the minds of his hearers may be moved and their actions determined. A mastery of words and of correct and elegant language may be acquired by the study of rhetoric and its kindred branches (see the chapter entitled, *The Writer*, in this GUIDE). A knowledge of the subject to be discussed must be obtained by careful investigation, by personal experience, and by the study of books. One's understanding of the human mind and its motives may be improved by the study of philosophy, and especially that division of the science which is usually called psychology (see the references in the chapter entitled, *The Teacher*, in this GUIDE).

Greek and Roman Oratory.

Very much may be learned by studying the methods of famous orators of former times. Would you know the methods by which Demosthenes made himself the greatest orator of all time, and would you understand something of the distinctive qualities of his oratory? Read the article in the

Britannica, VII. 72; then read of the characteristics of Greek oratory in general, XI. 142. Read of Antiphon, the most ancient of Greek orators, II. 134 a; of Isæus, XIII. 376; of Hyperides, XII. 596 b; of Lysias, XV. 118; of Isocrates, XIII. 388; and of Andocides, II. 18.

Then see what is said about Roman oratory, XX. 719. Read of Cicero, V. 770, and XX. 514; of Hortensius, XII. 210; of Marcus Antonius, II. 140; of Domitius Afer, I. 225; of Julius Cæsar, IV. 633 and XX. 720.

British Oratory.

Then coming down to the oratory of modern times, read of Lord Chatham, V. 440; of Burke, IV. 544; of Fox, IX. 500; of the younger Pitt, XIX. 134; of Grattan, XI. 63; of Brougham, IV. 374; of Lord Derby, VII. 112; of Robert Hall, XI. 392.

American Oratory.

Finally, arriving at the study of our own American orators, read I. 721 b′, and I. 722 b″. Then turn to the article on Patrick Henry, XI. 676; and afterward to those on Fisher Ames, I. 735; Daniel Webster, XXIV. 471; Henry Clay, V. 817; John C. Calhoun, IV. 683; Edward Everett, VIII. 736.

The rules that govern argumentative bodies should be thoroughly understood by every public speaker. Hence refer to

Parliamentary law, sup. 2300.

Parliamentary procedure, XVIII. 311.

Quorum, sup. 2486.

Once started in this course of reading, you will be surprised at the large number of additional subjects which will suggest themselves; and if you are actually in earnest, you will need no guide to point out their whereabouts in the *Britannica*. You will be able to depend upon and help yourself.

As an example of the manner in which a single subject may be studied with a view to its discussion in public, let

us suppose that you are preparing a lecture on temperance.

The Temperance Lecturer.

What help can the *Encyclopædia Britannica* give you? Let us see. That the wisest of ancient philosophers advocated temperance, see XXII. 237, and II. 677; and that they declared it to be one of the cardinal virtues, see VIII. 580.

Read of Bacchus, VII. 248, and XVII. 839.

Then, coming to later times, study the valuable article on DRUNKENNESS, VII. 481; also Liquor Laws, XIV. 688 and sup. 1892; Temperance societies, XXIII. 158; Good Templars, XXIII. 159.

Prisons, XIX. 747.

Poor-houses, XIX. 468.

Other articles and sections which may be read at pleasure are:

John B. Gough, sup. 1431.
Prohibition laws, sup. 1892.
Option laws, sup. 1893.
South Carolina dispensary system, sup. 1894.
The Gothenburg dispensary plan, sup. 1895.
Raines liquor law, sup. 1893.
Prohibition Party, sup. 2453.
Father Mathew societies, XV. 631.
Alcoholic beverages, sup. 117.
Distillation of spirits, VII. 264 a.
BREWING, IV. 294; fermentation, XXIV. 602.
Brewing in the United States, sup. 560.
Brandy, IV. 216.
Whisky, XXIV. 542.
Effects of whisky, XVIII. 407.
WINE, XXIV. 601.
Ale, I. 476.
Absinthe, I. 57.
Arrack, II. 628.

Gin, X. 602.
Liqueurs, XIV. 686.
Perry, XIV. 557,

and in like manner, through the entire list of intoxicating beverages. To these may be added such articles as

The Keeley Gold-cure, sup. 1775.
Delirium tremens, VII. 50.
Insanity, XIII. 95 ; in relation to crime, VI. 584.
Heredity, VIII. 608 ; XIII. 96, and XI. 837.

The list of books and other publications which advocate the cause of temperance, XXIII. 160, will be found of much value in directing you to further research.

So much for the lecturer on temperance. The political speaker will find a selection of references for his special use in our chapter entitled, *The American Citizen ;* the pulpit orator will find an extensive array of references in the chapter for *The Preacher and Theologian ;* and, generally speaking, the various subjects adapted to public presentation and discussion receive due notice in this GUIDE, each under its especial heading. Hence it is unnecessary to multiply examples here.

Other Speakers.

The would-be orator, however, no matter what may be his theme, is recommended to follow out the course of reading suggested in the chapter entitled, *The Writer.*

CHAPTER LVII.

THE BOOKMAN.

"Come, and take choice of all my library."
—*Titus Andronicus.*

"We turned o'er many books together."
—*Mer. of Venice.*

To the lover of books the *Encyclopædia Britannica* is itself a great and inestimable treasure, the companion of leisure hours, the helper in time of need, the one indispensable portion of his library. No other single collection of volumes in the world furnishes so complete an equipment for all the business of life Without the *Britannica* no scholar's library is complete; without it no bookman's house can be fully furnished. It is not only in itself a book to be consulted and admired and cherished, but it is rich in information concerning other books that deserve to be admired and cherished. It is *par excellence* the bookman's book about books.

The Book Lover.

Would you like to learn something about the greatest books that the world has ever produced—something about the character of their contents;—something about their origin?

The following list of references will help you to find the information you desire:

FIFTY GREAT BOOKS.

The Bible, III. 634; sup. 442.
The Vedas, II. 698; Rig-Veda, XII. 780.
The Koran, XVI. 597.

Mahabharata, XXI. 281.
Ramayana, XXI. 280.
Shah-Nameh, XVIII. 656; IX. 225.
Zend Avesta, XXIV. 775.

Homer's Iliad, XII. 117.
Homer's Odyssey, XII. 119.
Aristotle's Ethics and Politics, I. 215; XIX. 349.
Demosthenes on the Crown, VII. 71.
Æschylus's Tragedies, I. 209.
Sophocles's Œdipus, XXII. 272.
Euripides's Medea, VIII. 675.
Aristophanes' the Knights, II. 508.
Herodotus, XI. 756.
Xenophon's Anabasis, I. 787.
Cicero's Orations, XX. 514; V. 770.
Virgil's Æneid, XXIV. 253.
Plutarch's Lives, XIX. 232; XVII. 334.
Malory's Morte d'Arthur XV. 337; X. 173.
The Eddas, VII. 649; XXII. 201.
Nibelungen Lied, XVII. 474.
Gesta Romanorum, X. 555.
Arabian Nights, XXIII. 316.
Lucian's "True History," XV. 43.

Dante's Divina Commedia, VI. 815.
Spenser's Faërie Queene, XXII. 394.
Ariosto's Orlando Furioso, II. 503.
Shakespeare's Tragedies, VII. 430.
Milton's Paradise Lost, XVI. 336–339.
Bunyan's Pilgrim's Progress, IV. 529.

Locke On the Human Understanding, VIII. 423.
Smith's Wealth of Nations, XIX. 366.

Gibbon's Decline and Fall of the Roman Empire, X. 578.
Mill's Logic, XVI. 312.
Darwin's Origin of Species, XXIV. 77.
Boswell's Life of Dr. Johnson, IV. 77.

Don Quixote, V. 352.
Gil Blas, XIV. 472.
Robinson Crusoe, VII. 28.
Gulliver's Travels, XXII. 766.
The Vicar of Wakefield, X. 672.
Voltaire's Zadig, XXIV. 285.
Goethe's Faust, X. 539.
The Waverley Novels, VIII. 434.
Victor Hugo's Les Misérabiles, sup. 1629.
Thackeray's Vanity Fair, XXIII. 215.
Dickens's David Copperfield, VII. 177.
George Eliot's Romola, sup. 951.

St. Augustine's Confessions, III. 75; VIII. 592; I. 216.
Thomas à Kempis's Imitation of Christ, XIV. 32.
Pascal's Pensées, XVIII. 335.
Keble's Christian Year, XIV. 26.
Jeremy Taylor's Holy Living and Holy Dying, XXIII. 93; VIII. 421.
Hooker's Ecclesiastical Polity, XII. 151.
Bacon's Essays and Novum Organum, III. 210.
Lewes's History of Philosophy, XIV. 491; VIII. 765.
Addison's The Spectator, I. 148; VIII. 427.
Macaulay's Essays, XV. 125.
Emerson's Essays, sup. 1135.
Carlyle's French Revolution, sup. 701.

We have named more than fifty. The list might be greatly extended, but it is unnecessary.

SOME BOOKISH SUBJECTS.

Album, I. 456.
Aldine—Aldus Manutius, XV. 512.
Almanacs, I. 590.
Ancient forms of books, XVIII. 144.
Anonymous, III. 657.
Alexandrian MS., I. 496.
Bibliography, II. 658; III. 654, 655.
Bibliomania, III. 655; sup. 457.
Bindings, IV. 41; XIV. 538; the "Arminian Nunnery," sup. 1259.
Block-books, III. 652; XXIII. 683.
Black-letter, XXIII. 686, 694.
Books, IV. 37; III. 651.
Book-cases, XIV. 536.
Book-house, XIII. 152.
Book-plates, sup. 519.
Book-scorpion, sup. 520.
Books for the Blind, sup. 496.
Books in the British Museum, sup. 577.
Bowdlerizing, sup. 536.
Broadsides, XVIII. 204.
Catalogues, XIV. 537, 539.
Copyright, XIV. 541. (See chapter entitled, *The Printer and Publisher*.)
Censorship of books, III. 639, 658.
Chap-books, XVIII. 204.
Classification of books, III. 661.
Cleaning of books, III. 821.
Condemned and prohibited books, III. 658.
De Morgan's Bibliography, VII. 67.
Dibdin, VII. 172.
Dictionaries, VII. 179–193; sup. 1044.

Ducykinck's Cyclopædia of Literature, sup. 1099.
Egyptian books, XIV. 510.
Folk-books, XVIII. 204.
Grolier, IV. 41 ; sup. 1473.
Grub Street, sup. 1475.
Harleiian Collection, sup. 1527.
Illuminated manuscripts, XII. 707 ; XVI. 437.
Incunabula, III. 653.
Indexes, XII. 729.
Index Expurgatorius, XII. 730 ; XIX. 714.
Macaronics, IX. 355.
Magliabechi, XV. 217 ; XIV. 530.
Manuscripts, VII. 253 ; XVIII. 144 ; XXIII. 682.
Pamphlets, XVIII. 204 ; XVII. 413.
Prohibited books, III. 658 ; XII, 730.
Pseudonyms, III. 657.
Rare and curious books, III. 654.
Xylographic books, XXIII. 682.

LIBRARIES.

Libraries (general article), XIV. 509–551.
Libraries of the United States, XIV. 534 ; sup. 1873.
Library Management, XIV. 536.
Library Catalogues, XIV. 539.
Library of Congress, sup. 1874, 3139 ; XIV. 535.
State Libraries, XIV. 535.
The Advocates' Library, sup. 53.
Astor Library, sup. 272.
Tilden Library, sup. 2914.
Boston Public Library, sup. 527.
Libraries in Chicago, sup. 783.
Libraries in Philadelphia, sup. 2364.
Lenox Library, sup. 1864.
Pratt Library, Baltimore, sup. 2436.

National Library, sup. 3139.
Assyrian libraries, III. 191.
Egyptian libraries, XIV. 510.
Chinese libraries, XIV. 534, 549.
Arabian libraries, XIV. 514.
Library of the British Museum, XIV. 514.
Monastic libraries, XIV. 513, 527.
Bodleian Library, XIV. 519.
Bibliothèque Nationale de Paris, XIV. 524.
Biblioteca Vaticana, XIV. 529.

LIBRARIANS.

Magliabechi, XV. 217.
Richard de Bury, XIV. 514.
Melvil Dewey, sup. 1038.
W. F. Poole, XIV. 540; sup. 2417.
A. R. Spofford, sup. 1874, 2769.

CHAPTER LVIII.

THE TEACHER.

"The true university of our day is a collection of books."
—*Thomas Carlyle.*

VALUABLE as the *Encyclopædia Britannica* is to persons of all callings and professions, there is no one who can derive greater benefit from it than the teacher. To the man or woman actively engaged in education, its worth is beyond all estimation. It is an exhaustless mine of knowledge, offering information on every imaginable subject. It is an obliging friend, answering the thousands of perplexing questions that are daily and unexpectedly presented, and never making a mistake. It is the teacher's *vade mecum*, the indispensable companion to which he turns for help and guidance in every time of need. If one were asked to point out the articles of greatest value to the educator, he could not answer; he could only say, "All are valuable." To the teacher of sciences, the articles on scientific subjects will be referred to most frequently (see the references on pages 90–129 of this volume). The teacher of mathematics will derive aid from the numerous chapters and treatises on mathematical subjects (see page 130). And so, whether you are a teacher of geography, or of philosophy, or of literature, or of history, or of music, or of art, or of any other department of human knowledge, you will find the *Britannica* always ready to supplement your instruction, and to aid you in the work which you have in hand.

The Teachers' Book.

This is the day of educated teachers—of teachers who are learned not only in the branches which they teach at school, but in the principles which underlie the practice of their calling. Pedagogy has become a distinct science. School-teaching is no longer a haphazard business, but it is a profession conducted on lines as exact as those which determine the practice of law or of medicine or of theology. The teacher who neglects or refuses to recognize this fact is already on the road to failure, and his successor is knocking at the door.

Pedagogy.

In the present chapter it is proposed to mark out two or three brief courses of professional reading for teachers—courses which may be pursued at odd moments at home, and which will in no small measure take the place of similar courses of study in teachers' institutes and normal colleges. The teacher who follows them out faithfully will not only be better equipped for examinations, but will be possessed of a broader and deeper knowledge of his profession, and consequently much better prepared to grapple with its difficulties and avoid its perplexities.

I. HISTORY OF EDUCATION.

Let us take as the starting point and basis of this course of reading the article EDUCATION, in the seventh volume of the *Britannica*. This article, which covers ten double-column pages (671–681), is the work of Oscar Browning, of Cambridge University, well known in this country for his work on Educational Theories. The object of the article is mainly to outline the history of educational theories in the chief crises of their development, and no attempt is made to discuss the science of teaching, or to describe the practical working of any particular

method or theory. Let us, then, study the history of education from the following references:

Education in Greece and Rome.

Old Greek education, VII. 671.
Plato, XIX. 194.
Old Roman education, VII. 671.
Quintilian, XX. 187, 514.

Early Christian education, VII. 671.
Clement, V. 819.
Origen, XVII. 839.
Tertullian, XXIII. 196.
Augustine, III. 75.

Education in the Middle Ages, VII. 671.
See also Knighthood, XIV. 110.

The Middle Ages.

Charlemagne, V. 402.
Alcuin, I. 472.
Bede, III. 480.
John Scotus Erigena, VIII. 522.

Gerhard Groot, XI. 207.
Thomas à Kempis, XIV. 31.
Brethren of the Common Life, XVI. 711.
Education at the time of the Renaissance, VII. 672.
See also Erasmus, VIII. 512.
Luther, XV. 71.
Melanchthon, XV. 833.

Twelve famous teachers:
Sturm (1507–89), XVII. 673.
Roger Ascham (1515–78), II. 677.

Famous Teachers.

Comenius (1592–1671), VI. 182.
Ignatius Loyola, XV. 31.
Arnauld, II. 620.
Pascal, XVIII. 333.

August Hermann Francke, IX. 701.

Pestalozzi, VII. 677.
Froebel, IX. 792.
Jacotot, XIII. 539.
Thomas Arnold, II. 626.
Horace Mann, XV. 492.
Lindley Murray, sup. 2128.
Mary Lyon, sup. 1936.
James B. Angell, sup. 186.

Writers on Education:

Books and Writers.

Roger Ascham ("The Scholemaster"), II. 677.
Montaigne, XVI. 767; VII. 674.
John Locke, XIV. 751.
John Milton ("Tractate on Education"), XVI. 324.
The Port Royalists, IX. 661.
Rousseau ("Émile"), XXI. 26.
Pestalozzi ("Leonard and Gertrude"), VII. 677.
Jean Paul Richter ("Levana"), XX. 546.
Goethe ("Wilhelm Meister"), X. 732.
Herbert Spencer, sup. 2764.
Alexander Bain, sup. 319.
F. A. P. Barnard, sup. 357.
William T. Harris, sup. 1532.

II. EDUCATIONAL INSTITUTIONS IN THE OLD WORLD.

Plato's Academy, I. 68; other famous academies, I. 69.
The Athenæum, II. 831.
Universities, XXIII. 831. (This extensive article exhibits the universities in their historical development, each being brought under notice, as far as practicable, in the order of its original foundation.)

Universities and Colleges.

Oxford University, III. 317; XXIII. 837.
Cambridge University, III. 579; IV. 728; XXIII. 838.

Aberdeen University, sup. 26.
Edinburgh University, XXIII. 846.
University of Leipsic, XIV. 429; XXIII. 841.
Gresham College, sup. 1468.
Newnham College, sup. 2182.
Public schools in England: Charter House, sup. 757; Eton, VIII. 632; Christ's Hospital ("Blue-coat School"), sup. 800; Harrow, sup. 1534; Westminster School, sup. 3127.

Musical conservatories, VI. 291; XVII. 83.
Technical schools, XXIII. 105.
Schools for the blind, III. 816, 826.
Special Schools. Schools for the deaf and dumb, II. 722; VII. 5.
Industrial schools, XX. 338.
Kindergartens, XIV. 79.

Schools in England, XIV. 834.
Schools in France, IX. 513.
Schools in Germany, X. 470.
Schools in Russia, XXI. 71.

III. EDUCATION IN THE UNITED STATES.

A comprehensive and exceedingly interesting article on the history of Higher Education in the United States is contained in sup. 1116–1122. This article is the work of Dr. B. A. Hinsdale, of Michigan University, and should be read not only by every American teacher, but by every person who would be informed concerning the progress of education and of educational ideas in this country. It is a worthy companion article to the very complete history of Universities, XXIII. 831.

Higher Education.

Statistics, showing the number of colleges and universities in each State, sup. 1109.
Adelbert College, sup. 47.
American University at Washington, sup. 167.
Amherst College, sup. 167.
American School at Athens, sup. 277.
Colleges. Antioch College, sup. 198.
Baylor University, sup. 385.
Beloit College, sup. 414.
Boston University, sup. 528.
Brown University, sup. 593.
Bryn-Mawr College, sup. 602.
Catholic University of America, sup. 724.
Chicago, University of, sup. 3003.
Clark University, sup. 821.
Colgate University, sup. 862.
Colorado College, sup. 871.
Colorado University, sup. 871.
Columbia University, sup. 874; XVII. 456.
Columbian University, sup. 874.
Cornell College, sup. 920.
Cornell University, sup. 920.
Dartmouth College, sup. 988.
Depauw University, sup. 1029.
Dickinson College, sup. 1044.
Earlham College, sup. 1105.
Fisk University, sup. 1283.
Franklin and Marshall College, sup. 1329.
General Theological Seminary, sup. 1378.
Georgetown University, sup. 1382.
Georgia, University of, sup. 1385.
Girard College, sup. 1401.
Hamilton College, sup. 1515.
Hamline University, sup. 1516.

Hampden-Sydney College, sup. 1518.
Harvard University, sup. 1538.
Radcliffe College, sup. 1538.
Haverford College, sup. 1547.
Howard University, sup. 1623; XI. 500.
Illinois University, sup. 1656.
Indiana University, sup. 1675.
Iowa College, sup. 1693.
Iowa, University of, sup. 3005.
Johns Hopkins University, sup. 1746.
Kansas, University of, sup. 1771.
Kenyon College, sup. 1783.
Knox College, sup. 1802.
Lafayette College, sup. 1822.
Lake Forest University, sup. 1824.
Lawrence University, sup. 1847.
Leland Stanford Junior University, sup. 1861.
Miami University, sup. 2053.
University of Michigan, sup. 2057.
Military Academy at West Point, sup. 2061.
Military Colleges and Schools, sup. 2063.
Minnesota, University of, sup. 2075.
Mississippi, University of, sup. 2080.
Missouri, University of, sup. 2083.
Montana, University of, sup. 2095.
McKendree College, sup. 1957.
Maine State College, sup. 1974.
Manhattan College, sup. 1981.
Mount Holyoke College, sup. 2121.
Muhlenberg College, sup. 2123.
Nashville, University of, sup. 2138.
Nebraska, University of, sup. 2156.
New York, University of, sup. 2205.
University of New Mexico, sup. 116.

Niagara University, sup. 2207.
North Carolina University, sup. 2219.
Northwestern University, sup. 2224.
Notre Dame, University of, sup. 2228.
Oberlin College, sup. 2235.
Ohio State University, sup. 2244.
Ohio Wesleyan University, sup. 2245.
Oklahoma University, sup. 2247.
University of Pennsylvania, sup. 2342.
Pratt Institute, Brooklyn, sup. 2435.
Princeton University, sup. 2447; XIX. 742.
Purdue University, sup. 2478.
Randolph-Macon College, sup. 2509.
Rochester, University of, sup. 2562.
Rutgers College, sup. 2594.
St. Louis University, sup. 2606.
South Dakota, University of, sup. 2759.
Syracuse University, sup. 2843.
Tennessee, University of, sup. 2877.
Texas University, sup. 2886.
Trinity College, sup. 2944.
Tufts College, sup. 2957.
Tulane University, sup. 2957.
Union College, sup. 2979.
University of the South, sup. 3005.
Vanderbilt University, sup. 3021.
Vassar College, sup. 3024.
Vermont, University of, sup. 3035.
Virginia, University of, sup. 3053.
Washington, University of, sup. 3095.
Washington and Lee University, sup. 3097.
Wellesley College, sup. 3120.
Wesleyan University, sup. 3123.
Western Reserve University, sup. 3125.

Williams College, sup. 3159.
Yale University, XVII. 394; sup. 3216.

College Fraternities in the United States, sup. 863.
University settlements, sup. 3005.
University Press, sup. 3005.
Technical schools in America, sup. 2862.
Business colleges, sup. 635.
Special Schools. Scientific schools, I. 70.
Smithsonian Institution, sup. 2738.
Scientific societies, sup. 52.
Chautauqua Literary and Scientific Circle, sup. 762.
University Extension, sup. 3002.
Examinations, VIII. 777.
Fellowships, sup. 1256.
Private schools in the United States, sup. 2648.
Public schools in the United States, sup. 2650.
High schools in the United States, sup. 2656.
Manual training in the public schools, sup. 1985–2659.
Normal schools in the United States, sup. 2115, 2657.
Evening schools, sup. 2657.
Rural schools, sup. 2660.
Kindergartens, XIV. 79; sup. 1790.
School system among the Indians, sup. 1669.
Schools in Indian Territory, sup. 1676.
Compulsory education, sup. 2661.
Legal education in the United States, sup. 1856.
Medical education in the United States, sup. 2025.
Theological education in the United States, sup. 2889.
Union Theological Seminary, sup. 2980.
Education of Women in the United States, sup. 3180.
National Bureau of Education, sup. 2658.

IV. EDUCATION IN VARIOUS COUNTRIES.

Generally a full account of the educational institutions of any country may be found in the article referring to the country in question.

United States, XXIII. 828.
France, IX. 512.
Institute of France, XIII. 160.

At Home and Abroad.

Germany, X. 470.
Great Britain, VII. 679; XIV. 834.
Scientific academies, XXII. 221; sup. 32.
Italy. XIII. 460.
Russia, XXI. 71.
Austria, III. 118.
Iceland, XII. 619.
India, XII. 774.
Arabia, II. 253.

V. PSYCHOLOGY.

The article on PSYCHOLOGY, by Professor James Ward, of Trinity College, Cambridge (Volume XX.) fills nearly fifty pages of the *Britannica*, and contains more matter than the ordinary school text-books on this subject. The teacher who cares to go so deeply into the study as to master this entire treatise will probably not desire a more extended course of reading. It may be preferable, however, to read only selected portions of the article, and to supplement the knowledge thus gained with collateral readings from other sources. In such case the following subjects may be included: Definition, page 37; standpoint of psychology, page 38; constituent elements of mind, page 39; feeling, page 40; attention, page 41; dependence of action on feeling, page 43; relativity, page 49; sensation

Science of Mind.

and movement, page 50; perception, page 52; intuition of things, page 55; imagination or ideation, page 57; obliviscence, page 61; expectation, page 63; feeling, page 66; intellection, page 75, etc.

Evolution of mind, VIII. 70.
Mental association, II. 730.
Mental powers of man, II. 109.
Apperception, sup. 207.
Attention, III. 52.
Relativity of knowledge, I. 58.
Sense distinguished from understanding, VIII. 1.
Locke on this subject, XIV. 758.
Faculties of perception, XVIII. 845.
Kant on imagination, XIII. 852.
Memory—mnemonics, XVI. 532.
Optimism and pessimism, XVIII. 684.

The following biographical notes should also be read:

Great Psychologists.

Aristotle, II. 522.
Xenocrates, XXIV. 719.
Democritus, VII. 59.
Plato, XIX. 201.
Thomas Brown, IV. 388.
Bishop Berkeley, III. 589.
Pierre Charron, V. 431.
Etienne de Condillac, VI. 251.
Victor Cousin, VI. 525.
Descartes, VII. 126.
Kant, XII. 848.
Leibnitz, XIV. 422.
Herman Lotze, XV. 14.
Schleiermacher, XXI. 411.
Schopenhauer, XXI. 457.
Hegel, XI. 620.

Herbart, XI. 719.
Samuel Bailey, III. 242.
David Hume, XII. 352.
G. H. Lewes, XIV. 491.

VI. THEORIES OF EDUCATION.

Plato's, VII. 671.
Socrates's, XXII. 236.
Theories of Education. Quintilian's, VII. 671.
Brethren of the Common Life, XI. 207.
Theories of Erasmus, VII. 672; VIII. 512.
Theories of Sturm, VII. 673.
Theories of Comenius, VI. 182; VII. 673.
The Jesuits', theory, XIII. 645.
The Port Royalists', XIX. 533.
Rousseau's, VII. 675.
Pestalozzi's, XIV. 79; XXII. 798.
Froebel's, IX. 792.
Herbart's, XI. 798.
Locke's, XIV. 757.
Milton's, XVI. 330.

CHAPTER LIX.

THE WRITER.

"Certainly, the art of writing is the most miraculous of all things man has devised."—*Thomas Carlyle.*

"There are two duties incumbent upon any man who enters on the business of writing—truth to fact, and a good spirit in the treatment."—*Robert Louis Stevenson.*

I. PENMANSHIP AND ITS ALLIED ARTS.

FIRST, as to the manual exercise of penmanship, what is there in the *Britannica* which commends itself to the writer, or to him who is interested in the art of writing? Let us see.

Without implements and materials there can be no writing. The history of these and the description of their manufacture cannot fail to be of interest.

Writing Materials. Read the article PEN, XVIII. 483; also the account of the manufacture of modern steel pens, in the American Revisions; INK, XIII. 79; then an account of the invention of paper, IV. 38; of its invention by the Chinese, V. 662; of the uses made of it in ancient times, XVIII. 144; and, finally, the special article PAPER, XVIII. 217. Read also of the Papyrus, XVIII. 231; and of Parchment, XVIII. 271; XIV. 390, and IV. 37. The earliest writing materials are described in XVIII. 231 b.

Handwriting. A concise history of the art of writing may be found in sup. 3207. The history of ancient handwriting is related in a very interesting article on PALÆOGRAPHY, XVIII. 143–165; the ancient system of Hieroglyphics, XI. 794; cuneiform writing, VI.

707, and XI. 217; Mexican picture writing, XVI. 212; Chinese writing, V. 653–659; Sanskrit, XXI. 269–272.

A comprehensive history and description of Alphabets is given in I. 600–614.

The alphabets of different nations also receive separate notice. For example:

The Phœnician, XI. 807, and XVIII. 802, 806; Egyptian, XI. 807; Greek, XI. 597; Roman, XIII. 125; Sanskrit, XXI. 270; the old Norse Runes, XXI. 366, 370.

The deaf and dumb alphabet is described in VII. 8; the phonetic method in XVIII. 812, and XXII. 381, and the phonographic in XXI. 836.

(See, also, Archæology, II. 342, and the chapter in this GUIDE, entitled, *The Stenographer and Typewriter*.)

II. COMPOSITION AND RHETORIC.

The mental processes of writing are closely related to the various branches of language study, such as grammar, rhetoric, prosody, etc. Hence the inquiry may be made, "What are the principal articles in the *Britannica* which will be interesting and useful to the busy man who wishes to acquire correctness and facility in English composition?" Let us briefly notice a few.

Composition.

The special article RHETORIC, XX. 509, is interesting and comprehensive, and in large part historical. Notice the section on rhetoric in ancient Greece, XX. 509; that on rhetoric in the Middle Ages, XX. 515; and that on modern writers on rhetoric, XX. 515.

Rhetoric.

Still pursuing the history of this subject, read the notice of Aristotle's rhetoric, II. 517; of Lysias's, XV. 118; and of Quintilian's, XX. 187. Read also the brief account of Whately's famous work, XXIV. 530.



Being fairly introduced into this study, you are now prepared to consult the *Britannica* for the large number of separate articles relating to the terms, expressions, and rules of rhetoric and its kindred branches of study. Here are some that are found in the first two volumes; they are mentioned simply as examples, trusting that the reader will be able to find all other articles of the kind without further directions:

In Volume I. Acrostic, Alcaics, Allegory, Alliteration, Alexandrine Verse, Anacoluthon, Anachronism, Anagram, Abbreviations, etc.

In Volume II. Anecdote, Anticlimax, Antithesis, Antonomasia, Aphorism, Apologue, Apothegm, etc.

In the American supplements many additional articles may be found, such as:

Blank Verse, sup. 494.
Climax, sup. 833.
Apostrophe, sup. 205.
Hexameters, sup. 1577.
Prosody, sup. 2459.

By observing the list of terms and expressions used in any text-book in rhetoric, you may complete this list; and then, by finding the various articles in the *Britannica*, you will observe how much more fully they are treated there than in any of the smaller manuals.

The article GRAMMAR, XI. 37, belongs rather to the philologist than to the writer, and more to the student than to the busy man. The section on school grammars, XI. 43 a, is interesting, and well worth your reading.

Grammar.

Every writer will find certain articles in the *Britannica* very valuable for reference in case of any dispute or lapse of memory regarding best usage, etc. For example, the articles on ABBREVIATIONS, I. 26, and sup.

16, contain a correct list of all the more common abbreviations used by reputable writers. The latter article is very complete. It is followed by a list of Abbreviatory Signs, sup. 23, showing the marks and symbols employed in commerce and in the various arts and sciences. A list of Forms of Address employed in letter-writing is given in sup. 46.

The methods pursued in correcting printers' proofs are fully explained in sup. 2454. If the date of any important event has been forgotten, it may very likely be found by referring to the CHRONOLOGICAL TABLE, V. 720. In short, the *Britannica* is always ready to aid one's memory, and to no other individual does it give more assistance in this way than to the writer.

But, after all, it is chiefly through the study of the works of the best writers that one can hope properly to improve his own style, and to acquire facility and elegance in the use of language. Hence the busy writer is urged to make a special study of the references in the chapter on *Literature* in this GUIDE; also the chapter entitled, *The Public Speaker*.

III. ONE HUNDRED SUBJECTS FOR ESSAYS.

The following list is designed chiefly to aid teachers and pupils at school in the selection of subjects for essays, some of the materials for which may be acquired through the systematic study of certain articles in the *Encyclopædia Britannica*. A good rule, which every writer should attempt to observe, is this: "Never undertake to write upon any topic until you have made a careful study of that topic. Store your mind with knowledge, so that your writing will be the visible expression of your thoughts. Always have something to say before you attempt to speak." The various references mentioned or pointed

out will indicate some of the places in the *Britannica* where information regarding those subjects may be found. But they are intended only as hints, and are not designed to relieve the student from the very necessary labor of independent research.

Subjects for Essays.

1. Temperance. See the references given in the chapter entitled, *The Public Speaker*.

2. The Wonders of Electricity. See VIII. 3; XV. 773; XX. 249. The references in the chapter for *The Electrician*, in this GUIDE, will be helpful.

3. Ancient Oratory. See the references to famous speakers, in the chapter entitled, *The Public Speaker*.

4. American Poetry. Study the article on American literature, I. 731–734. Read also the biographical sketches of the great American poets: Henry W. Longfellow, XIV. 860; John G. Whittier, sup. 3146; William Cullen Bryant, sup. 601; James Russell Lowell, sup. 1924; Edgar Allan Poe, XIX. 255; Walt Whitman, sup. 3145.

5. True Greatness in Man. See biographical sketches of such men as Joseph, XIII. 749; Moses, XVI. 860; Confucius, VI. 258; Buddha, III. 375; Elijah, VIII. 134; Socrates, XXII. 231; Cato, V. 239; Charlemagne, V. 402; King Alfred, I. 506; St. Louis, XV. 18; Savonarola, XXI. 333; Galileo, X. 30; John Milton, XVI. 324; George Washington, XXIV. 387; and many others.

6. The Earth. See references in the *Courses of Reading in Geography*, in this GUIDE.

7. Mountains. Refer to special article, XVII. 4.

8. The Ocean. Water of, XXI. 611; waves, XXIV. 419; depths, III. 17; temperature, VI. 4; tides, XXIII. 353; fishes, XII. 684.

9. Great Cities of the World. See London, XIV. 818; Paris, XVIII. 274; New York, XVII. 457; Berlin, III.

598; and others that will readily be suggested. Consult the Index volume.

10. Ships and Sailors. See chapter in this GUIDE, entitled, *The Seaman.*

11. Progress of Inventions. See in this GUIDE, the readings in "Archæology," and also the chapter entitled, *The Inventor.*

12. The Steam Engine. Consult the Index volume; refer also to the chapter in this GUIDE entitled, *The Machinist.*

13. War and Peace. Refer to the chapter entitled, *The Soldier.* See International Peace, XIII. 197. Consult the Index volume.

14. Slavery. See special article, XXII. 129; ancient slavery, XIX. 348; negro, XVII. 319. Consult Index volume. Read about Wilberforce, XXIV. 565; Clarkson, V. 813; Garrison, X. 85; Wendell Phillips, sup. 2326; John Brown, IV. 385; and the anti-slavery leaders named in the chapter entitled, *The Philanthropist and Reformer.*

15. Socialism. Consult Index volume. Read about Robert Owen, XVIII. 87; Fourier, IX. 489; Saint-Simon, XXI. 197; Rodbertus, XX. 616; Proudhon, XIX. 867; the Shakers, XXI. 736; the Oneida Community, XVII. 772.

16. Taxation. See references in this GUIDE, in the section on Finance in the chapter entitled, *The Banker and Financier.*

17. The Origin of Language. See VIII. 769; consult Index volume under the headings Language and Philology. See references in this GUIDE, in the *Readings in Philology.*

18. Land Tenure. Consult Index volume. See Adam Smith, XIX. 367; Ricardo, XIX. 374; Henry George, X. 742.

19. Law in Ancient Times. Consult the references in the chapter entitled, *The Lawyer.*

20. Feudalism. Consult Index volume. See Knight, XIV. 110; Castle V. 197; Tournaments, XXIII. 489; Chivalry (Index); Homage, XII. 107, etc.

21. The Revival of Learning. See Renaissance, XX. 380. Consult Index volume

22. The Art of Printing. See references in the chapter entitled, *The Printer and the Publisher*, in this GUIDE.

23. Newspapers. See references in the chapter entitled, *The Journalist.*

24. Perseverance Leads to Success. For illustrations of this truth, see the biographical references in this GUIDE, page 40.

25. Education in Greece and Rome. See the references in the chapter entitled, *The Teacher.*

26. Great Educators. See the references in the chapter entitled, *The Teacher.*

27. The Science of Education. See the references in the chapter entitled, *The Teacher.*

28. Famous Institutions of Learning. See the references in the chapter entitled, *The Teacher.*

29. The Progress of Medical Science. See the historical and biographical references in the chapter entitled, *The Physician*, in this GUIDE. Consult Index volume.

30. Music and Musicians. See the references in the chapter entitled, *The Musician*, in this GUIDE.

31. The Discovery of America. See VI. 173; X. 180; XI. 171; Icelandic discoveries, XII. 624; early knowledge of, X. 178; original inhabitants, XVI. 206; origin of name America, X. 182, and XXIV. 192. See also references in this GUIDE, in the *Readings in History.*

32. Great Americans. See the biographical references in this GUIDE.

33. Washington and Lafayette. Consult Index volume. See references to great Americans, above.

34. Hamilton and Burr. See XI. 412; XXIII. 756; XIX. 384; XI. 413.

35. Great American Orators. See the biographical references in the chapter entitled, *The Public Speaker.*

36. The Invention of the Telescope. Consult Index volume.

37. The Telegraph and the Telephone. See the references in the chapter entitled, *The Electrician,* in this GUIDE.

38. Astrology. See the references given, in this GUIDE, in the chapter on Astronomy.

39. The Philosopher's Stone. See the references given, under *Alchemy*, in this volume, page 170.

40. The Progress of Chemistry. See special article, V. 459. Consult Index volume.

41. The Air We Breathe. Consult Index volume; also see Atmosphere, Oxygen, Respiration, Ventilation, Asphyxia.

42. Water and its Uses. Consult Index volume.

43. Curious Facts About Trees. See the references in the chapter entitled, *The Woodsman.*

44. The Solar System. See the references on page 91, of this GUIDE.

45. The Moon. Consult the Index volume.

46. The Worship of the Sun. By the Greeks, II. 185; by the Phœnicians, XVIII. 802; by the Sabæans, XXIV. 741; at Heliopolis, XIX. 91; at Baalbec, III. 177.

47. The Fire Worshipers. See XXIV. 193; XVII. 158; XI. 679; XIX. 807.

48. The American Indians. Consult Index volume.

49. African Explorations. Consult Index volume.

50. The Arctic Regions. See II. 478; XIX. 315; X. 190; IX. 721.

51. The Gulf Stream. Consult Index volume.

52. Great Cities. See the references on page 125 of this GUIDE.

53. Our Government. See the references in the chapter entitled, *The American Citizen.*

54. Monarchy. Consult Index volume; also see references on page 282 of this GUIDE.

55. The Mongol Races of Asia. Consult Index volume.

56. China and Japan. Consult Index volume.

57. Buddha and Buddhism. Consult Index volume.

58. Missions. See the references on page 382 of this GUIDE.

59. Idolatry. See XII. 698, 710.

60. Mohammedanism. Consult Index volume.

61. The Jews. Consult Index volume. See also *Readings for Bible Students.*

62. The Gipsies. Consult Index volume.

63. The Moors in Spain. See, in Index volume, the following subjects: Spain, Arabs, Moors, Alhambra, Granada, Ferdinand and Isabella.

64. The Turks. Consult Index volume.

65. The Battle of Hastings. See the following subjects in Index volume: William the Conqueror, Normans, Harold, Hastings, Battle.

66. Trial by ordeal. See XVII. 818.

67. Trial by jury. Consult Index volume.

68. The Knights Templars. See Templars, in Index volume.

69. Poetry. Consult Index volume.

Consult Index volume, and also this GUIDE, for valuable references to the following subjects:

70. Chaucer, the father of English poetry.

71. Milton and Dante.

72. Shakespeare's Dramas.

73. The Greek Drama. See also references on page 442, of this GUIDE.

74. Pope and Dryden.

75. Addison and the Spectator.

76. Dr. Samuel Johnson.

77. Dictionaries. See also references in the chapter entitled, *The Bookman*, in this GUIDE.

78. History of Agriculture. See the chapter entitled, *The Farmer*, in this GUIDE.

79. Patents. See the chapter entitled, *The Inventor*, in this GUIDE.

80. Copyright. See *The Printer and the Publisher*, in this GUIDE.

81. Books and How they Are Made. See the chapter entitled, *The Printer and the Publisher*, in this GUIDE.

82. On Costume.

83. On Commerce. See also the chapter entitled, *The Merchant.*

84. On Exercise. See Athletic Sports, Health, Gymnastics, Callisthenics, etc.

85. On Games and Amusements. See also the chapter on *Sports and Pastimes.*

86. Domestic Animals. See Horse, Dog, Cat, Sheep, etc.; also the references on page 48, of this GUIDE.

87. The Animal Kingdom. See the readings about animals, page 47, of this GUIDE.

88. Labor and Capital. See the references in the chapter entitled, *The Laborer*, in this GUIDE; also XXIII. 500.

89. Great Guns. See the references in the chapter entitled, *The Soldier*, in this GUIDE.

90. Invention of Gunpowder.

91. War. See also the chapter entitled, *The Soldier*, in this GUIDE.

92. Stories of Old Greece. See *Legends*, page 165, of this GUIDE.

93. Myths of the Old World. See the references on page 163, of this GUIDE.

94. The Greatest Books. See the references in the chapter entitled, *The Bookman*.

95. The World's Great Thinkers. See the biographical references on page 149, of this GUIDE.

96. Great Reformers. See references on pages 383–387, of this GUIDE.

97. The Work of the Farmer. See the chapter entitled, *The Farmer*.

98. Famous Merchants. See references on page 324, of this GUIDE.

99. The Trade of the World. See references on page 324, of this volume.

100. Superstition. See page 170, of this volume.

CHAPTER LX.

THE STENOGRAPHER AND TYPEWRITER.

"For your writing and reading, let that appear when there is no need."
—*Much Ado About Nothing*

THE successful stenographer and typewriter should be a person of many accomplishments. He should, in the first place, be a thorough master of the art of short-hand writing, alert in mind, quick with the hand, accurate, ingenious. In the second place, he should understand thoroughly the construction and manipulation of the type-writing machine, should be a good speller, should know how to punctuate correctly and when to use capital letters, and should have a practical acquaintance with the rules of English grammar and composition and with the forms to be observed in letter-writing. Besides all this, a general knowledge of business forms and methods is often of great benefit, sometimes indispensable. If, in addition to all these qualifications, the stenographer has at command a stock of information regarding history, politics, the sciences, and the arts, he may be quite sure that he will never want for a good position and a comfortable salary.

Qualifications.

Young men and young women who are obliged to help themselves to an education of this kind will find no surer guide than the volume which they now hold in their hands; they will find no better or more trustworthy assistant than the *Encyclopædia Britannica*. As regards that sort of general education to which we have just alluded, let the student of

General Information.

stenography and type-writing consult the references named in various chapters of this GUIDE—for example: the *Readings in History;* the *Readings in Geography;* the *Readings in Physics;* the chapters entitled, *The American Citizen*, *The Lawyer*, *The Merchant and Trader*, *The Banker and Financier*, *The Builder*, etc. As regards the special kind of knowledge which is indispensable to the practice of his art, he will find much that is helpful and instructive in such articles as the following:

History of the English language (modern), VIII. 399–403.

Language.

Phonetics, XVIII. 811.
Phonetic spelling, XVIII. 812.
Speech sounds, XXII. 381.
Alphabet, I. 601.

Abbreviations, I. 26, and sup. 16.
Abbreviatory signs, sup. 23.

Tachygraphy, or ancient systems of shorthand, XVIII. 164.
Shorthand in English-speaking countries, XXI. 836.
The a b c systems, XXI. 836.
Pitman's phonography, XXI. 838–840.

Shorthand.

Foreign shorthand systems, XXI. 841.
Stenography, sup. 2784.
Sir Isaac Pitman, sup. 2396; XXI. 834.
Ben. Pitman, sup. 2395.
Parliamentary reporting, XXI. 841.

Forms of address in letter-writing, sup. 46.

Type-writers, sup. 2972–2975.
Type-writing machines, XXIV. 698.

CHAPTER LXI.

THE PRINTER AND THE PUBLISHER.

"Once invent Printing, you metamorphosed all Universities, or superseded them."—*Thomas Carlyle.*

I. TYPOGRAPHY.

ONE of the most interesting articles in the *Encyclopædia Britannica* is that which relates to the history of printing, Volume XXIII., pages 681–696. Here we have an account of the first attempts at printing, which antedated the time of Gutenberg and of Caxton by many years, if not by many centuries. Then follow chapters on block-printing, page 682; on the old block-books of German origin, page 683; on the work of Gutenberg at Mainz, page 684; on the invention controversy, page 687; on the history of the earliest types, with fac-similes, page 693, etc. In connection with the reading of this article, references may be made to the following articles:

Invention of Printing.

Great Printers.

John Gutenberg, XI. 336.
Johann Faust, IX. 853.
William Caxton, V. 279; books printed by him, VIII. 413.
Aldus Manutius, XV. 512, 514.
Christopher Plantin, XIX. 176.
Elzevir, VIII. 156.
Jodocus Badius, III. 228.
Stevens, or Estiennes, XXII. 534.

The history of modern types, XXIII. 695, next claims

our attention. The Italic type, first used by Aldus Manutius, is said to be an imitation of the handwriting of Petrarch. The origin of all other types in common use is explained in this chapter, which closes with a complete list of works on the invention, progress, and process of printing. Some notice of early English typography is given in XIV. 705, and also in the article on Caxton referred to above.

Types.

The latter half of the article on typography, XXIII. 697, is devoted to the discussion of practical printing. Here are separate chapters on type-setting or composing, page 700; on stereotyping or electrotyping, page 702; on press-work and presses, page 704; on color-printing, page 708; on artistic printing, page 709; on the departments of a printing establishment, page 710.

In connection with this part, refer to the articles, ENGRAVING, VIII. 439; and LITHOGRAPHY, XIV. 697. The following articles also contain additional information on subjects connected with the printer's art:

Old Wine-press of Gutenberg, sup. 2448.
The Stanhope Press, sup. 2448.
The Adams Press (1824), sup. 2448.
The Washington Press (1829), sup. 2448.
Job Presses, sup. 2449.
Cylinder Presses, sup. 2449.

Presses.

Illustrated-work Printing Machines, sup. 2450.
Perfecting Presses, sup. 2451.
Mammoth Presses, sup. 2451.
Lithographic Presses, XIV. 1012.
Color Printing, sup. 871.
Richard M. Hoe, sup. 1512.
University Press, sup. 3005.
See, especially, Proof-readers' Marks, sup. 2454.
International Typographical Union, sup. 1814.

Type-founding, XXIII. 699.
Type-setting machines, XXIII. 700; sup. 2969.
The linotype, sup. 1889.
Invention of stereotyping, X. 127.
Electrotypes, VIII. 115.
Type for the blind, sup. 496; III. 827.
George Bruce, type founder, sup. 596.
Theodore L. De Vinne, sup. 1030.

II. BOOKS AND BOOKSELLING.

See the special article on BOOKS, IV. 37.
Constituent parts of books, III. 652.
Ancient forms of books, XVIII. 144.
Old Books. Material of ancient books, IV. 37, 38.
Early printed books, III. 652.
Rare and curious books, III. 654.
Anonymous and pseudonymous books, III. 657.
Condemned and prohibited books, III. 658.
Bookbinding, IV. 41.
Albums, I. 456; almanacs, I. 590.
Annals, II. 60; anthologies, II. 103.
Encyclopædias, VIII. 190.
Libraries. Libraries, XIV. 509; Sir Thomas Bodley, III. 848; Sir Robert Bruce Cotton, VI. 509; Magliabechi, XV. 217; Dibdin, VII. 172; bibliomania, III. 655.
Bookselling, IV. 39; book-trade in Europe, X. 472.
Baron Tauchnitz, sup. 2858.
Copyright. Copyright, VI. 356; English laws of copyright, XIV. 541; international copyright, I. 720.
History of copyright since 1877, sup. 913.
For other references, see the chapter entitled, *The Bookman.*

CHAPTER LXII.

THE JOURNALIST.

"We read nowadays in the market place—I would rather say in some large steam factory of letter-press where damp sheets of new print whirl round us perpetually."—*Frederic Harrison.*

AN entertaining and valuable article on newspapers is contained in the seventeenth volume of the *Britannica*, pages 412–437. The history of journalism in Great Britain is given at length, and is followed by an account of the newspapers of other European countries. The NEWSPAPERS OF THE UNITED STATES is the subject of an interesting and appreciative chapter, XVII. 433–437. In a supplementary article on the same subject, sup. 2186–2177, a complete account is given of the methods pursued in the publication of a great American newspaper, and some hints are presented with reference to the qualifications of the successful journalist. This article is illustrated with views of many of the great newspaper buildings.

History of Journalism.

Methods of gathering the news, sup. 2188.

Editorial departments of a great newspaper, sup. 2189.

Mailing of newspapers, sup. 2189.

The Sunday paper, sup. 2190.

Journalism as a profession, sup. 2191.

Associated Press organization, sup. 2194.

Several other articles in the *Britannica* relate directly or indirectly to this important subject. Among these the following are especially interesting:

Acta Diurna, I. 128.

Reporting, XX. 404; XXI. 841.

Advertisements, I. 177, 178.

The article on ADVERTISING, sup. 52, is full of interesting facts relating to this important department of journalism, especially in America.

Printing of newspapers, XXIII. 703, 709.

Laws relating to newspaper press, XIX. 710.

Periodicals, XVIII. 535.

History of British periodicals, XVIII. 536; of French periodicals, same volume, page 539; of American magazines and reviews, page 544.

American magazines, sup. 1967.

The Associated Press, sup. 269.

Censorship of the Press, III. 658, 659.

Press Laws, XIX. 710–714.

See *Typography*, in this GUIDE.

FAMOUS JOURNALISTS.

Benjamin Franklin, IX. 711; his connection with American journalism, XVII. 433.

Newspaper Men.

Horace Greeley, XI. 160; XVII. 434.

George Ripley, XX. 567.

John Walter and the "London Times," sup. 3077.

Thurlow Weed, sup. 3114.

William T. Stead, of the "Review of Reviews," sup. 2781.

Granier de Cassagnac, sup. 1440.

Charles A. Dana, sup. 983.

Joseph Gale, sup. 1358.

Edwin L. Godkin, sup. 1414.

Joseph Pulitzer, sup. 2476.

James Gordon Bennett, III. 574.

James Gordon Bennett, Jr., sup. 441.



John W. Forney, sup. 1311.
Henry T. Raymond, sup. 2514.
Whitelaw Reid, sup. 2530.
Joseph Medill, sup. 2029.
Henry Watterson, sup. 3107.
Allen Thorndyke Rice, sup. 2545.
John Russell Young, sup. 3223.

See *The Writer*, *The Printer*, *The American Citizen*, and *Readings in the History of Literature*, all in this GUIDE.

CHAPTER LXIII.

THE ARTIST.

"In framing an artist, art hath thus decreed
To make some good, but others to exceed."

— *Pericles.*

I. PAINTING.

A GENERAL examination of the place of painting among the FINE ARTS will be found in the article under that heading, Volume IX., page 206. But the most interesting and by far the most valuable article on this subject is that entitled: SCHOOLS OF PAINTING, XXI. 433–448. This article may be read by sections, with collateral references to other articles and to the notices of individual painters, as indicated below:

Schools of Painting.

1. Classical School of Painting.

For the early history of painting among the Greeks and Romans, see Volume II., pages 353, 358, 363, 366.

See also Zeuxis, XXIV. 783; Parrhasius, XVIII. 321; Sicyon, II. 349; Apelles, II. 169.

2. Italian School of Painting, XXI. 433; Giotto, X. 609; Masaccio, XV. 605; Fra Lippo Lippi, XIV. 685; Sandro Botticelli, IV. 165; Michelangelo, XVI. 229; Andrea del Sarto, XXI. 315; Giorgio Vasari, XXIV. 94; Raphael Sanzio, XX. 274; Leonardo da Vinci, XIV. 455; Salvator Rosa, XX. 846; Titian, XXIII. 413.

3. German School of Painting, XXI. 438; Hans Holbein, XII. 53; Albrecht Dürer, VII. 554; Hans Holbein, the younger, XII. 54; Anton Raphael Mengs, XVI.

10; Julius Schnorr, XXI. 416; Johann Fried. Overbeck, XVIII. 76; Wilhelm von Kaulbach, XIV. 16.

4. Flemish School of Painting, XXI. 438; Van Eyck, VIII. 814; Van der Weyden, XXI. 439; Hans Memling, XV. 846; Quintin Matsys, XV. 620; Antonio Moro, XVI. 840; Rubens, XXI. 41; Vandyck, XXIV. 59.

5. Dutch School of Painting, XXI. 439; Ruysdael, XXI. 114; Vandevelde, XXIV. 59; Paul Potter, XIX. 600; Hobbema, XII. 30; Rembrandt, XX. 373.

6. Spanish School of Painting, XXI. 440; Zurbaran, XXIV. 829; Velasquez, XXIV. 132; Murillo, XVII. 55; Goya, XI. 22; Fortuny, XXI. 443.

7. French School of Painting, XXI. 440; Nicolas Poussin, XIX. 649; Claude Lorrain, V. 814; Watteau, XXIV. 414; Claude Vernet, XXIV. 168; Prud'hon, XX. 1; Horace Vernet, XXIV. 169; Delaroche, VII. 41; Rousseau, XXI. 22; Millet, XVI. 321; sup. 2066; Meissonier, sup. 2031; Regnault, XX. 346; Rosa Bonheur, sup. 517.

Impressionism in French Art, sup. 1661.

8. British School of Painting, XXI. 441; Hogarth, XII. 47; Sir Joshua Reynolds, XX. 502; Gainsborough, X. 15; Richard Wilson, XXIV. 593; Paul Sandby, XXI. 257; Sir Henry Raeburn, XX. 218; William Blake, III. 804; Eastlake, VII. 615; Sir Edwin Landseer, XIV. 280; Holman Hunt, sup. 1634; J. M. W. Turner, XXIII. 663; Dante Gabriel Rossetti, XX. 857; E. J. Poynter, sup. 2434; Burne-Jones, sup. 628; Sir Frederic Leighton, sup. 1860; Sir John Millais, sup. 2065; George F. Watts, sup. 3107.

9. American Painters: Thomas Hill, sup. 1583; Winslow Homer, sup. 1602; William M. Hunt, sup. 1635; George Inness, sup. 1683; Eastman Johnson, sup. 1747; John La Farge, sup. 1821; Will H. Lowe, sup. 1923;

F. D. Millet, sup. 2067; Washington Allston, sup. 136; John Singleton Copley, VI. 347; Benjamin West, XXIV. 505; John S. Sargent, sup. 2632.

II. PROCESSES OF PAINTING.

Materials used in Painting, XVIII. 137.

Kinds of Painting.

Painting in water-colors, XVIII. 139, and XIX. 86.

Enamel—On metal, VIII. 182; in jewelry, XIII. 679; in pottery, XIX. 601.

Encaustic painting, VIII. 185.

Genre-painting, sup. 1379

Fresco, IX. 769.

Raphael's frescos, XX. 278.

Glass-painting, X. 667.

Aureola, III. 89.

Tempera, XXIII. 157.

Illumination, XII. 707.

Mural Decoration, XVII. 34–48 (a beautifully illustrated article).

Wall-painting, XVII. 39–48.

Miniatures, XVI. 437.

III. SCULPTURE.

History of Sculpture.

For the history of Greek and Roman sculpture, see the article on CLASSICAL ARCHÆOLOGY, II. 343; also Phidias, XVIII. 733; Polycletus, XIX. 416; Scopas, II. 360; Praxiteles, XIX. 660; Lysippus, XV. 120; Arcesilaus, II. 326.

Assyrian Sculpture, III. 190.

Etrurian Art, VIII. 639.

Early Christian Sculpture, XXI. 556.

English Sculpture, XXI. 557; John Flaxman, IX. 298; Francis Chantrey, V. 395; Alfred Stevens, XXI. 561.

French Sculpture, XXI. 562; Jean Antoine Houdon, XII. 314; François Rude, XXI. 50; David, VI. 842.

German Sculpture, XXI. 564; Vischer, XVII. 633; Schlüter, XXI. 566; Albert Wolff, XXI. 566.

Spanish Sculpture, XXI. 566.

Italian Sculpture, XXI. 567; Pisani, XIX. 122; Donatello, VII. 350; Orcagna, XVII. 814; Ghiberti, X. 566; Michelangelo, XVI. 230; Raphael, XX. 281; Giovanni da Bologna, XXI. 569; Benvenuto Cellini, V. 294; Bernini, III. 604; Canova, V. 24.

Venetian Sculpture, XXIV. 156; Veronese, XXIV. 172.

Scandinavian Sculpture, XXI. 570; Thorwaldsen, XXIII. 315.

American Sculpture: Hiram Powers, XIX. 650; Thomas Crawford, VI. 554; Horatio Greenough, XI. 173; Henry Kirke Brown, I. 352, sup. 588; W. W. Story, sup. 2796; Harriet Hosmer, sup. 1618; John Rogers, sup. 2565; Larkin G. Mead, sup. 2022; Augustus St. Gaudens, sup. 2603; R. S. Greenough, sup. 1464; Clark Mills, sup. 2067; Frederick McMonnies, sup. 1962.

Technical methods of sculpture (how a piece of statuary is made), XXI. 571.

Alto relievo, I. 643.

Relief, IX. 205; relief in wall decorations, XVII. 34; relations of sculpture to the Fine Arts, IX. 205.

IV. POTTERY, ETC.

Pottery and Porcelain.

The special article on this subject, XIX. 600–643, is one of much interest, amply and beautifully illustrated. The article on Ceramic Art, sup. 734, describes the development of this art since 1880, and is replete with interesting facts.

Prehistoric pottery, XIX. 602.

Egyptian pottery, XIX. 603.
Assyrian, XIX. 604.
Phœnician, XIX. 605.
Hellenic, XIX. 611.
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Græco-Roman and Roman, XIX. 617.
Persian and Moslem, XIX. 619.
Teutonic and Saxon, XIX. 623.
Mediæval, XIX. 624.
Majolica-ware, XIX. 624.
Spanish and Portuguese, XIX. 628.
French, XIX. 629.
Bernard Palissy, XVIII. 186.
Mediæval German-ware, XIX. 630.
English, XIX. 631.
Josiah Wedgwood, XXIV. 476.
Ancient Mexican-ware, XIX. 633.
Chinese porcelain, XIX. 633.
Japanese pottery, XIII. 454.
Sèvres-ware, XIX. 637.
Dresden-ware, XIX. 639.
English porcelain, XIX. 640.
Terra-cotta, XXIII. 190; Assyrian terra-cotta, II. 399; Etruscan, VIII. 641; Japanese, XII. 599.
Tiles, XXII. 387; encaustic tiles, VIII. 187; for wall-linings, XVII. 36.
Mosaic-work, XVI. 849; of Egyptians and Romans, XVI. 850; of the Middle Ages, XVI. 852.

V. METAL-WORK.

Metal-work as an ornamental art, XVI. 71.
Metal-work of Greece, XVI. 73.
Of Italy, XVI. 74.
Of England, XVI. 76.

Of Germany, XVI. 77.

Brasses and Bronzes.

Brasses, IV. 219; VII. 694.
Bronze-work, XVI. 71.
Japanese bronze-work, XIII. 591.
Chinese bronze-work, IV. 366.

Venetian bronze-work, XXIV. 156.
Iron-work in architecture, II. 466.
Hammered metal-work, XVI. 72.
Damaskeening, VI. 793.

VI. WOOD-WORK.

Wood-carving, XXIV. 644 (a six-page illustrated article treating mainly of ancient and mediæval work).

Wood-carving.

Wood-carving in Switzerland, XXII. 779.
Buhl-work, IV. 446.
Inlaying, XIII. 81.

Marquetry, IX. 849.

VII. PHOTOGRAPHY.

Special article on Photography, XVIII. 821–840, with supplement giving an account of the most recent improvements and discoveries, sup. 2370. See also:

Progress of Photography.

Daguerre, VI. 761.
Niepce, XVII. 495.
Photogravure, XXII. 717.
Photo-engraving, XVIII. 834.
Photolithography, XVIII. 833, 834.
Camera, IV. 740, 741; XVIII. 839; sup. 664.
Instantaneous photography, sup. 2371.
Photographs in natural colors, sup. 2372.
Woodburytypes, sup. 3186.
Albertypes, sup. 2374.
Artotypes, sup. 258.

Photochronograph, sup. 2370, 2373.
Dry plates, sup. 2371.
Plantinotypes and kallitypes, sup. 2376.
Astronomical photography, sup. 2376.
Röntgen or X rays, sup. 2372, 2574.

VIII. ENGRAVING.

History of Engraving.

Special article on Engraving, VIII. 435. A valuable supplementary article on engraving, giving an account of the latest advancement made in the art, may be found in sup. 1204–1206. Wood-engraving, VIII. 436; early engraving on wood, V. 99; in time of Albrecht Dürer, VII. 554; Bewick, III. 621.

Copper and steel plate engraving, VIII. 439; Mantegna, XV. 501; Audran, III. 70; Ferdinand Gaillard, VIII. 443.

Half-tone process, sup. 1205.
Wax process, sup. 1206.
Etching, VIII. 443.
Mezzotint, VIII. 445.
Lithography, sup. 1896.

IX. MISCELLANEOUS.

Drawing.

Drawing, VII. 446–451. Beginning on page 448, the article is an interesting and very readable critique on the art of delineation as practiced by different artists and in different countries.

Illumination of written or printed texts, XII. 707; illuminated borders of books, XXIII. 696.

Illuminated manuscripts, VI. 45; XII. 797.
Caricature, V. 103.
Arabesques, I. 233.
Embossing, VIII. 160.

Stamped leather for wall-decoration, XVII. 37.
Embroidery, VIII. 160.
Gilding, X. 593.
Etching, VIII. 443.
Lacquer-work, XIV. 194.
Lapidary, XIV. 298.
Cameo, IV. 738; cameos of mediæval times, IV. 739.
Ornamentation.
Work in ivory, XIII. 520.
Jewelry, XIII. 675–679.
Decalcomania, sup. 1007.

X. ILLUSTRATORS.

George Cruikshank, sup. 955.
Frank O. Darley, sup. 986.
Gustave Doré, sup. 1067.
George du Maurier, sup. 1092.
Mary Hallock Foote, sup. 1304.
"Alfred Crowquill," sup. 1312.
Harry Furniss, sup. 1353.
Charles D. Gibson, sup. 1394.
William Hamilton Gibson, sup. 1394.
Bernhard Gillam, sup. 1398.
Kate Greenaway, sup. 1461.
Augustus Hoppin, sup. 1613.
Thomas Nast, sup. 2138.
Joseph Pennell, sup. 2337.
Charles S. Reinhart, sup. 2530.
Frederic Remington, sup. 2531.
See Art Unions, sup. 258.

CHAPTER LXIV.

THE MUSICIAN.

"Such sweet compulsion doth in music lie."—*Milton.*

ALTHOUGH America has not yet produced a great composer of music, it has nevertheless a copious and important musical history. The article on MUSIC IN AMERICA, sup. 2128, wherein this history is narrated, will therefore be read with great interest, and doubtless also with profit, by every American musician who wishes to know anything about the origin and progress of music in his own country.

In the seventeenth volume of the *Encyclopædia Britannica* (pages 77–102), Professor Macfarren, of the University of Cambridge, presents a scholarly and comprehensive history of music, tracing its progress through western civilization, and showing how it has been changed from an artificial or calculated form to a natural or spontaneous. This article not only appeals especially to musicians and students of music, but it contains much that will interest the casual reader. It may be taken as the basis of a short course of study on this subject. It may be read in sections in connection with other special articles, as follows:

History of Music.

Origin of musical instruments, page 77. (See list of musical instruments below.)

Musical intervals, XVII. 78, 103.

Affinity of music to astronomy, XVII. 78. See Pythagoras, XX. 137.

Antiphony, XVII. 79; also II. 134.

Scales, XVII. 80.

Time in music, sup. 2915.

Tone in music, sup. 2926.

Harmony, XVII. 81. Special article on, VII. 593. The principles of harmony are treated still further in part IV. of the article Acoustics, I. 107.

Harmony.

Counterpoint, XVII. 82.

Academies of music, XVII. 83. See also ACADEMY, I. 78, and CONSERVATORY, VI. 291.

Troubadours, XVII. 83; also VII. 413; Minstrel, XVI. 479.

Madrigal, XV. 192.

Oratorio, XVII. 85–100; also Händel's XI. 435; Haydn's, XI. 549; Mendelssohn's, XVI. 8; in America, sup. 2130.

Hymns, XVII. 85; also the special article on this subject, XII. 577.

Psalmody in America, sup. 2129.

Choral tunes, XVII. 85.

Opera, XVII. 87, 99. See Scarlatti, XXI. 375; Lully, XV. 63; Wagner, XXIV. 313.

Cantata, XVII. 88.

Symphony, XVII. 95.

Among the many other articles on musical subjects the following are of especial interest:

Voice, and vocal music, XXIV. 273.

Plain song or chant, XIX. 168.

Vocal Music.

Anthem, II. 102.

Agnus Dei, I. 284.

Almai (Egyptian singers), I. 592.

Glee, X. 677.

Minuet, XVI. 492.

Scientific basis of music, XVII. 102–106 (a scholarly article by Professor Bosanquet, of the Royal College of Music, London).

MUSICAL INSTRUMENTS.

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Transverse flute, XXIII. 519.
Flageolet, IX. 351.
Bassoon, III. 425.
Lyre, XV. 113.
Æolian harp, I. 182, and sup. 54.
Harp, XI. 488.
Lute, XV. 70.
Violin, XXIV. 242.
Banjo, sup. 337.
Hornpipe, XII. 171.
French horn, XII. 167.
Dulcimer, sup. 1091.
Oboe, or hautboy, XVII. 705.
Trumpet, XXIII. 592.
Trombone, XXIII. 586.
Ophicleide, XVII. 705.
Organ, XVII. 828–839.
Barrel-organs, sup. 361.
Pianoforte, XIX. 64–78.

MUSICIANS AND COMPOSERS.

These are so numerous that we shall attempt to name only a few of the most famous. Reference to others may easily be made by consulting the Index volume.

Singers.

Jenny Lind, XIV. 662, sup. 1419.
Adelina Patti, sup. 2325.
Parepa Rosa, sup. 2576.
Emma Eames, sup. 2795.
Clara Louise Kellogg, sup. 2798.
Nellie Melba, sup. 2032.

Beethoven, III. 504.
Mendelssohn, XVI. 6.
Händel, XI. 433.
Haydn, XI. 538.
Composers. Franz Liszt, sup. 1895.
Moscheles, XVI. 222.
Czerny, VI. 755.
Lully, XV. 63.
Johann Strauss, sup. 2798.
Meyerbeer, XVI. 6.
Wagner, XXIV. 313.
Weber, XXIV. 467.
Brahms, sup. 546.
Scarlatti, XXI. 375.
Rubinstein, sup. 2586.
Paderewski, sup. 2279.
Pianists. Tschaikowsky, sup. 2954.
Gottschalk, sup. 1431, 2131.
Antonin Dvořák, sup. 1100.
Moritz Rosenthal, sup. 2578.
Lowell Mason, sup. 1009, 2130.
Theodore Thomas, sup. 2131, 2897.
Directors. Leopold Damrosch, sup. 2131.
Dudley Buck, sup. 605, 2132.
Reginald de Koven, sup. 605, 2132.
Anton Seidl, sup. 2678.
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Paganini, XVIII. 134.
Violinists. Corelli, VI. 394.
Ernst, VIII. 527.
Ole Bull, sup. 615.
Violin-makers: Stradivari, XXIV. 245; Amati, I. 654. See Cremona, VI. 567, and XVII. 98.

CHAPTER LXV.

THE ACTOR AND DRAMATIST.

"The best actors in the world, either for tragedy, comedy."—*Hamlet.*

THE word drama is from the Greek *drao*, meaning action. The invention of dramatic art is the direct outcome of a universal quality of human nature—the desire to imitate. Aristotle says that this desire is instinctive in man from his infancy. Children are perpetually going out of themselves; it is one of their chief amusements to represent those grown people whom they have had an opportunity of observing, or whatever strikes their fancy; "and, with the happy pliancy of their imagination, they can exhibit all the characteristics of any dignity they may choose to assume, be it that of a father, a schoolmaster, or a king." Here, then, is the first step towards the invention of the dramatic art. Imitation of action by action, however simple and unpremeditated, is a drama in embryo. The business of the dramatist is to invent this action and to mould it into a form sanctioned by the laws of literature. It is the business of the actor to present this action in its concrete form, agreeably to the laws of histrionic art. The actor is only the temporary interpreter of the dramatist,

The Drama.

The history of the drama, which includes both dramatic literature and its presentation on the stage, is a subject very interesting not only to all actors and dramatists, but to students of literature and art and humanity, and even to "the general reader."

History.

The *Encyclopædia Britannica* presents that history in a

form adapted to the convenience of all who care to peruse it, while its various related topics are so grouped and arranged as to afford every convenience for ready consultation. The following references, including the entire history of the drama and of dramatic representation, will point the way to several courses of systematic reading:

I. HISTORY OF THE DRAMA.

Egyptian drama, VII. 403.
Chinese drama, VII. 400.
Hindoo drama, VII. 396.
The Sákuntálá of Kálidása, XIII. 828; VII. 397.

The Greek drama, VII. 403, comprised two great divisions, tragedy and comedy.

The traditional inventor of tragedy was Thespis, VII. 404; hence the expression Thespian art, so often used to designate dramatic art.

Greek Drama.

Tragedy was defined by Plato as an imitation of the noblest life.

Comedy had its origin in sport; it was "the village song," the rustic jest, and formed the most complete contrast to tragedy.

Origin of tragedy, XI. 140.

The great masters of Greek tragedy were Æschylus, I. 208, VII. 403; Sophocles, XXII. 271; and Euripides, VIII. 673, XI. 140.

The construction of the Greek tragedy was essentially different from that of the modern play. See VII. 406.

Origin of comedy, VII. 407.

The master of Greek comedy, although by no means its inventor, was Aristophanes, II. 507. He was the representative of the Old Comedy, the distinctive features of which are described in VII. 407.

Of the Middle and the New Comedies, the greatest names are those of Eubulus and Menander, XVI. 2.

The Attic drama, represented by the great names just mentioned, had its origin in religion, VII. 408. Its religious character had much to do in modifying its representation upon the stage.

The Roman Drama—its origin, VII. 409.

Livius Andronicus, who was both dramatist and actor, produced the first regular Roman tragedy and the first great Roman comedy, XIV. 723, VII. 410. Other tragedians were:

Roman Drama.

Cnæus Nævius, XVII. 161.
Quintus Ennius, VIII. 447; XX. 717.
Lucius Accius, I. 83.
Lucius Annæus Seneca, XXI. 658.

Of the writers of Latin comedy the greatest names are
T. Maccius Plautus, XIX. 215.
Terence, XXIII. 186; XVI. 2.

With the triumph of the Christian Church in the 4th century, the Roman drama came to an end, VII. 412.

The Christian drama had its origin in dramatic compositions written doubtless for educational purposes as early as the 5th century.

St. Gregory Nazianzus, XI. 179; VII. 412.
Hrotsvitha, XII. 326.

Mediæval Plays.

Mystery-plays, VII. 412.
Miracle-plays, V. 324.
Moralities, VIII. 416; VII. 413.
Passion-play of Oberammergau, XVII. 703.

The English drama was the offshoot of the miracle-plays and moralities which survived even after the regular

tragedy and comedy of the modern stage had begun their course.

English Drama.

The first tragedy proper in the English tongue was *Gorboduc*, by Thomas Sackville, Lord Buckhurst, VIII. 416.

The earliest English comedy now extant was *Ralph Roister Doister*, by Nicholas Udall, XXIII. 716.

"Out of such promises as these the glories of our drama were ripened by the warmth and light of the great Elizabethan age." Of the Elizabethan dramatists, the following are the most famous:

John Lyly, VII. 429; XV. 103.
Thomas Kyd, XXI. 463.
Christopher Marlowe, XV. 556.
George Peele, XVIII. 457.
Robert Greene, XI. 163.
Thomas Lodge, XIV. 767; XVIII. 346.
Thomas Nash, XVII. 236.
WILLIAM SHAKESPEARE, XXI. 737. (See Index, page 401.)
Ben Jonson, XIII. 741.
John Webster, VII. 432.
Francis Beaumont, III. 469.
John Fletcher, XVIII. 347.
Philip Massinger, XV. 618.

The Puritans and the Drama, VII. 434.
Milton's *Comus*, XVI. 326.
Sir William Davenant, VI. 835.

Drama of the Restoration, VII. 434, 435.
John Dryden, VII. 488; VIII. 423.
William Wycherley, XXIV. 705.

William Congreve, VI. 271.
Sir John Vanbrugh, XXIV. 54.

Drama of the Eighteenth Century, VII. 435–438.
Addison's *Cato*, VIII. 425, 426; VII. 435.
Home's *Douglas*, XII. 107.
Allan Ramsay's *Gentle Shepherd*, XX. 266.
Gay's *Beggar's Opera*, X. 119.
Henry Fielding's comedies, IX. 142; VIII. 430.
Goldsmith's comedies, X. 760; VII. 435.
Sheridan's comedies, VII. 438; XXI. 797.

Drama of the Nineteenth Century, VII. 438, 439.
Byron's *Manfred*, IV. 604; VII. 438.
Shelley's *The Cenci*, VIII. 433; XXI. 789.
Bulwer-Lytton's *Richelieu*, XV. 121.

Modern Italian Drama, VII. 416–417.
Cinthio's *Hecatommithi*, X. 620.
Marquis S. Maffei, XV. 196.
Italian Drama. Alfieri, I. 502.
Manzoni, XV. 514.
Ariosto's comedies, VII. 418.
Guarini's *Pastor Fido*, XI. 236.
Goldoni, X. 759; XIII. 513.

The Spanish Drama, XXII. 356, 358; VII. 419.
Cervantes, XXII. 356; V. 347.
Lope de Vega, XXII. 357; VII. 420;
Spanish Drama. XXIV. 121.
Calderon de la Barca, XXII. 359; IV. 659.
Moreto, VII. 422; XVI. 821.
Cienfuegos, V. 775.
Bartolomé Torres Naharro, XXII. 356.

The French Drama, VII. 423.
Bible-plays, IX. 647; miracle-plays, IX. 648.
Stephen Jodelle, VII. 423; XX. 841.
The Classical Drama, IX. 654.
Robert Garnier, VII. 423.
Corneille, VII. 424; IX. 655.
Racine, IX. 663.
Voltaire, XXIV. 285; IX. 670.
Molière, IX. 659; XVI. 624.
French Drama. Victor Hugo, VII. 427; IX. 676.
Minor dramatists, IX. 660.
Dramatists of the Empire, IX. 676.
Victorien Sardou, sup. 2631.
Theatre Français, sup. 2888.

The German Drama, X. 529; VII. 440.
Lessing, VII. 441; X. 536.
German Drama. "Sturm und Drang," VII. 442; X. 540.
Goethe, X. 537, 721; VII. 442.
Schiller, XXI. 395; X. 538.
Hans Sachs, X. 528; Gustav Freytag, X. 541.
The Romantic School, VII. 443
Later dramatists, X. 545.

The Dutch Drama, XII. 91, 96.
Dutch Drama. Hooft, XII. 93, 146.
Van den Vondel, VII. 444; XII. 94.
Maurice Maeterlinck (Belgium), sup. 1966.

The Scandinavian Drama, XXI. 754; XVII. 590; VII. 92.
Holberg, XII. 56.
Oehlenschläger, XVII. 730.
Björnstjerne Bjørnson, XVII. 591.
Henrik Ibsen, XVII. 591.

II. THE THEATRE.

By this word we have reference to a place specially devised for dramatic representations. See the following articles or parts of articles in the *Encyclopædie Britannica :*

The Greek theatre, its invention and plan, XXIII. 222 ; II. 413.

Dionysiac Theatre at Athens, III. 3.

The Roman theatre, VII. 411 ; XXIII. 223 ; II. 419.

Amphitheatre, X. 65 ; I. 774.

Colosseum, II. 419 ; XXIII. 420.

Theatres.

Early English theatres, VII. 428 ; XXIII. 224.

Blackfriars Theatre, VIII. 419.

Globe Theatre, XXI. 761.

Theatres of Paris, XXIII. 225 ; XVIII. 277.

Drury Lane Theatre, XXIII. 226.

Theatres of New York, XVII. 461.

Chinese theatres, V. 666.

The stage in Greek theatres, VII. 408.

The Stage.

In Roman theatres, VII. 411.

In early English theatres, VIII. 420.

In modern theatres, XXIII. 226.

Costumes and scenery, XXIII. 225.

Masks in Greek tragedy, VII. 408.

The cothurnus, VII. 408.

The Coventry-plays, VII. 414.

Pageants, VII. 416.

Masques, VII. 431.

III. ACTORS AND ACTING.

The Histrionic Art, VII. 396 ; IX. 209.

Actors : Greek, VII. 408 ; Roman, VII. 411 ; Hindu, VII. 399 ; English, VII. 434, 439 ; Chinese, VII. 402.

Livius Andronicus, XIV. 723.

Richard Burbage, XXI. 761.
David Garrick, X. 83.
Mrs. Sarah Siddons, XXII. 32.
John Kemble, XIV. 31.
Fanny Kemble, sup. 1778.
Edmund Kean, XIV. 21.
William Charles Macready, XV. 167.
Barton Booth, IV. 48.
Edwin Booth, sup. 521.
Lawrence Barrett, sup. 362.
Dion Boucicault, sup. 531.
Ernesto Rossi, sup. 2579.
Anna Cora Mowatt, sup. 2553.
Edwin Forrest, sup. 1312.
Joseph Jefferson, sup. 1738.
Charlotte Cushman, sup. 971.
Mary Anderson, sup. 2144.
Richard Mansfield, sup. 1984.
Maggie Mitchell, sup. 2085.
Fanny Davenport, sup. 992.
Clara Morris, sup. 2110.
Sir Henry Irving, sup. 1715.
Ellen Terry, sup. 2881.
Helena Modjeska, sup. 2087.
Lilian Neilson, sup. 2158.

In general, the names and biographies of all the most popular actors on the American stage may be found by consulting the American supplements to the *Encyclopædia Britannica*.

IV. THE ART OF DRAMATIC COMPOSITION.

See VII. 390–396.

In the first place, a dramatic action must possess unity. See VII. 390; XVI. 81.

It must be complete. See VII. 391.
Prologues and epilogues, VII. 392.
See Chorus in Greek Drama, XVII. 79.
Climax and catastrophe, VII. 393.
Characterization, VII. 394.
Consistency, VII. 394.
Tragedy and comedy, VII. 395.
Gesture, speech, costume, VII. 396.

CHAPTER LXVI.

THE HOME-MAKER.

"Our books, gardens, family, scenery, might all bring forth to us far greater wealth of enjoyment and improvement if we tried to squeeze the very utmost out of them."—*Charles Buxton.*

"A home without books is like a room without windows."—*Henry Ward Beecher.*

THE *Britannica* would be lacking in completeness if it did not contain a number of practical articles on topics of domestic interest and utility. An examination of any single volume will show that it is not in the least deficient in this respect. To any person having in charge the affairs of a home or a family, this great work offers a variety of useful information that is not to be found in any similar publication.

A. THE HOUSEHOLD.

House-building.

Do you think of building a house for yourself? See the article on Building, IV. 447. Consult, also, the supplementary article on American Architecture, sup. 218; and notice the practical references in the chapter entitled, *The Builder*, in this GUIDE. Then refer to the following valuable articles, or parts of articles:

Sanitation of the house, XII. 567.

Progress in American sanitary science, sup. 2402.

Ventilation of the house, XII. 567; ventilation by chimneys, XXIV. 160.

Sewerage, XXI. 711; sup. 2403.

Plumbing, IV. 502; sup. 2402.

Water-closets, XXI. 716.
Water-pipes, XXII. 484.
Paper-hangings, IV. 512.
Japanese paper-hangings, XIII. 591.
Tapestry, XXIII. 211.
Heating apparatus, XI. 590; XXIV. 161; sup. 1352.
Stoves, XXII. 579.
The latest improvements in cook-stoves, sup. 2796.

FURNISHING.

After the house has been built, other questions will present themselves, and the following articles in the *Britannica* will be read with interest:

Furniture, IX. 847.
Bed, sup. 396.
Chairs, IX. 849.
Carpets, V. 127.
Mural decoration, XVII. 34.

FOODS.

The busy housewife, upon whose wisdom and discretion so much of the family happiness depends, will find a vast fund of information, and often some valuable practical suggestions, in such articles as these:

Cooking-stoves, XXII. 579.
Cookery, VI. 331.
Adulteration of foods, I. 169.
Cookery among the Arabs, II. 251.
Baking, III. 250–258.
Baking-powder, sup. 323.
Food, sup. 1298.
Dairy foods, VI. 768.
Table showing the composition of different foods, sup. 1298.

Milk, XVI. 301.
Cream, XVI. 303.
Butter, IV. 590.
Cheese, V. 455.
Coffee, VI. 110.
Tea, XXIII. 97.
Chocolate, V. 680.
Lard, XIV. 312.
Use of salt in food, sup. 1301.
Sugar, XXII. 622.
Sugar in the United States, sup. 1988, 2818.
Honey, XII. 136.
Gelatine, X. 130.
Gluten, X. 695.
Preserved foods, XIX. 707.
Jelly, as conserve of fruit, XIII. 564.
Tinned foods, XIX. 708.
Arrowroot, II. 631.
Canned fruit, sup. 703.
Macaroni, XV. 125.
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Nutritive lichens, Iceland moss, etc., XIV. 559.
Curry, VI. 715.
Cinnamon, V. 785.
Nutmeg, XVII. 666 (illustrated).
Allspice, XIX. 97.
Pepper, XVIII. 516; cayenne, V. 280.
Confectionery, VI. 256.
Aërated waters, I. 184.
Mineral waters, XV. 431.
Ice, XII. 611.

Read the valuable article on dietetics, VII. 200.
Digestion of foods, sup. 1299.

Diet in sickness, VII. 205.

The uses of water in dietetics, XXIV. 399.

Dietetics. Meals, VII. 209.

Plutarch on dietetics, VI. 181.

Lord Combermere's rules, VI. 181.

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Lamps, XIV. 244.
Sewing-machines, XXI. 718.
Needles, XVII. 313.
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Combs, VI. 177.
Brushes, IV. 403.
Looking-glasses, IX. 849.
Pottery (see page 432, of this GUIDE).
Cups, XIX. 180.

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What to do in case of asphyxiation, II. 716.
Antidotes to poisons, XIX. 276.
What to do in case of burns, XXII. 681.
Burns and scalds, sup. 629.
Some rules for the care of the sick, VII. 205.

Other topics will suggest themselves to every intelligent housekeeper, and these may generally be found by referring to the Index volume.

See, also, the chapters in this GUIDE entitled, respectively, *The Farmer*, *The Gardener*, *The Physician*, and *The Fruit Grower*.

B. SOCIAL LIFE.

DRESS.

A long list of articles on subjects connected with the social life of the home might be given here. The following will be sufficient to indicate their number and variety:

Costume: In Volume VI., page 453, there is a complete history of dress, with illustrations.

Gloves, X. 692.
Girdles, X. 622.
Shoes, XXI. 830; boots, sup. 522.
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MUSIC.

See the chapter in this GUIDE entitled, *The Musician.*

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See the chapter entitled, *The Artist.*

INDOOR AMUSEMENTS.

Billiards, III. 674.
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Riddles, XX. 549.

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Cigars, V. 776; XXIII. 426.
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